

Bid No. 2021-07-22

TOWNSHIP OF PISCATAWAY
MIDDLESEX COUNTY
NEW JERSEY
TOWNSHIP OF PISCATAWAY

**“2021- RESTORATION AND EXPANSION AT THE HISTORIC
METLAR BODINE HOUSE”**

MAYOR
BRIAN WAHLER

PISCATAWAY TOWNSHIP COUNCIL
KAPIL K. SHAH, COUNCIL PRESIDENT
MICHELE LOMBARDI, COUNCIL VICE PRESIDENT
GABRIELLE CAHILL
JAMES BULLARD
STEVE D. CAHN
FRANK UHRIN
LINWOOD ROUSE

BUSINESS ADMINISTRATOR
TIMOTHY J. DACEY

TOWNSHIP CLERK
MELISSA A. SEADER

PROJECT MANAGER
GUY GASPARI, P.E. P. L.S, P.P., C.P.W.M/CONNOLY & HICKEY ARCHITECTS
DIRECTOR OF PUBLIC WORKS/PROFESSIONAL ARCHITECTS
455 HOES LANE PISCATAWAY, NJ 08854

**ANY QUESTIONS MUST BE E-MAILED TO Purchasing@piscatawaynj.org NO LATER
THAN JULY 19, 2021. @ 12noon. PHONE CALLS WILL NOT BE ACCEPTED THERE WILL
BE NO EXCEPTIONS.**

Bid Opening Date: Thursday July 29, 2021 AT 2:00 PM

BIDDER: _____

ADDRESS: _____

TEL. NO.: _____

EMAIL: _____

NOTICE TO BIDDERS

BID NO: 2021-07-22

TOWNSHIP OF PISCATAWAY
MIDDLESEX COUNTY, NEW JERSEY

NOTICE IS HEREBY GIVEN that sealed bids will be received by the Business Administrator or designated representative, for the Township of Piscataway, on **THURSDAY, JULY 29, 2021 at 2:00PM** prevailing time, which will be publicly read via zoom as listed below. This bid opening will be broadcast LIVE via Zoom. Bids will be publicly opened and reviewed for completeness for the following:

“2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE”

Bids must be made on standard proposal form, be enclosed in a sealed package bearing the name and address of bidder and the words **“2021-RESTORATION AND EXPANSION OF THE HISTORIC OF THE METLAR BODINE HOUSE”** on the outside and delivered to the Township Purchasing office only, 455 Hoes Lane, Piscataway, NJ 08854 during regular business hours, 8:30 am to 12:20 pm and 1:30 pm to 4:30 pm., Monday through Friday, excluding holidays. *Please be advised that the municipal building is closed daily between 12:20 PM and 1:30 PM.*

Bidders must call the purchasing office at 732-562-2321 to drop off the sealed bid. The Municipal building is closed to the public due to the Covid-19. PLEASE, DROP OFF YOUR SEALED BID TO THE PURCHASING AGENT BY 12NOON.

Bids Specifications, Plans and instructions to bidders may be obtained at:
<http://bids.piscatawaynj.org/>

SITE VISIT: JULY 13, 2021 @ 2p.m. at: Metlar-Bodine House -1281 River Road, Piscataway, NJ 08854

Question and Answer Due Date: JULY 19, 2021 by 12 Noon, E-mail only to:
Purchasing@piscatawaynj.org

Addendum may be downloaded from the Township website <http://bids.piscatawaynj.org/>

(1) Bid Packet Marked “ORIGINAL” (1) Photo Copy of the Original “TRUE COPY”

During the Covid-19 pandemic, while the statewide “State of Emergency” declaration is still in effect in according with Executive Order 107 all proposal packets will only be read and opened electronically “BROADCAST LIVE” via ZOOM Bid opening. The Municipal building is closed due to the Covid-19 restrictions. Once the bid opening is concluded bidders must call the Purchasing Agent @ 732-562-2321 to set an appointment if bidders wishes to review any of the bids.

All bids shall be kept sealed , and will be received and publicly opened on the proposal opening date and time in the Township Council Chambers using Virtual teleconferencing which can be access by logging in to zoom in the following manner:

Join Zoom Meeting:

Piscataway Purchasing is inviting you to a scheduled Zoom meeting.

Topic: Piscataway Bid Opening-**2021-Restoration &Expansion of the Historic Metlar Bodine House**

Time: July 29, 2021 2:00 PM Eastern Time (US and Canada)

Join Zoom Meeting

<https://us02web.zoom.us/j/81540971746?pwd=T1pMb2FTQmVIYWFlVmZqeWx0czNiUT09>

Meeting ID: 815 4097 1746

Passcode: 421339

One tap mobile

+16468769923,,81540971746#,,,,*421339# US (New York)

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+1 346 248 7799 US (Houston)

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Bids can be hand delivered to the Municipal Building by calling the Purchasing Agent Purchasing@732-562-2321. If using an outside delivery and/or messenger service (i.e. Federal Express, UPS, etc.), please note the following: **The Township will not be responsible for deliveries made prior to or after normal business hours, or to any other office, or for the failure of a bidder to affix the label provided with the bid package on the courier envelope.**

Surety in the form of a bid bond, certified check or Cashier's Check in the amount of ten percent (10%) of the total price bid, but not in excess of \$20,000.00, payable unconditionally to the Township of Piscataway shall submit with the bid. The successful bidder will be required to furnish a Performance Bond in the Amount of 100% of total bid. Bidders shall comply with the requirements of N.J.S.A.10:5-31 and N.J.A.C. 17-27 et seq. Division of Purchasing.

Bid NO: 2021-07-22

TOWNSHIP OF PISCATAWAY: “2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE”

Bidder’s Electronic Question Due Date: JULY 19, 2021 @12NOON

Purchasing@piscatawaynj.org

PRE-BID Conference / Site Visit Date: JULY 13, 2021@2 p.m. @ Metlar House-1281 RIVER ROAD, PISCATAWAY.

Bid Submission Due Date: THURSDAY, JULY 29, 2021 - 2 PM

Please, make sure your Sealed Bid arrives by 12 noon.

Bidders must call the purchasing office at 732-562-2321 to drop off the sealed bid. The Municipal building is closed to the public due to the Covid-19.

PLEASE, DROP OFF YOUR SEALED BID TO THE PURCHAING AGENT BY 12NOON.

THE BID WILL BE OPENED VIA ZOOM @2PM.

Bid Opening via ZOOM: Instructions below:

During the Covid-19 pandemic, while the statewide “State of Emergency” declaration is still in effect in according with Executive Order 107 all proposal packets will only be read and opened electronically “BROADCAST LIVE” via ZOOM Bid opening. The Municipal building is closed due to the Covid-19 restrictions. Once the bid opening is concluded bidders must call the Purchasing Agent @ 732-562-2321 to set an appointment if bidders wishes to review any of the bids.

All bids shall be kept sealed , and will be received and publicly opened on the proposal opening date and time in the Township Council Chambers using Virtual teleconferencing which can be access by logging in to zoom in the following manner:

Join Zoom Meeting

Piscataway Purchasing is inviting you to a scheduled Zoom meeting.

Topic: Piscataway Bid Opening-2021-Restoration &Expansion of the Historic Metlar Bodine House

Time: July 29, 2021 02:00 PM Eastern Time (US and Canada)

Join Zoom Meeting

<https://us02web.zoom.us/j/81540971746?pwd=T1pMb2FTQmVIYWFlVmZqeWx0czNiUT09>

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Meeting ID: 815 4097 1746

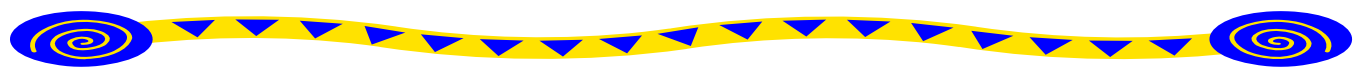
Passcode: 421339

REQUIRED: (1) Bid Packet Clearly Marked "ORIGINAL", Documents all filled out & Signed in Blue Ink.

ONLY (1) ORIGINAL CERTIFIED BID BOND IS REQUIRED" IN THE ORIGINAL BID PACKET.

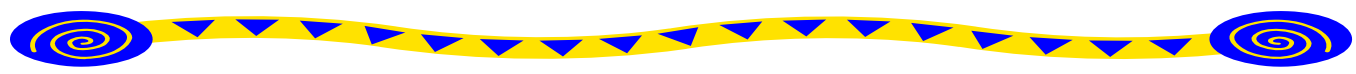
REQUIRED: (1) a Photo Copy of the Original Bid Clearly Marked "TRUE COPY"
No original documents in the true copy.

THE TOWNSHIP OF PISCATAWAY



INSTRUCTIONS TO BIDDERS

PAGES 1-57



MARIA E. VALENTE-CAEMMERER

Purchasing Agent

BID BOILER PLATE

PUBLIC WORKS

Revised June 2018

Piscataway

PUBLIC WORKS

Bid Specifications & General Requirements For

2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE

BID NO: 2021-07-22

THURSDAY JULY 29, 2020

Bid Opening Date

2:00 p.m.

Bid Opening Time

Opening Location: 455 Hoes Lane
Piscataway, NJ 08854

MARIA E. VALENTE-CAEMMERER

Purchasing Agent

The Township of Piscataway

REQUEST FOR BIDS
GUY GASPARI, DIRECTOR OF PUBLIC WORKS/CONNOLLY & HICKEY HISTORICAL ARCHITECTS
Bid Advertisement

The Township of Piscataway, New Jersey, hereby advertises for competitive bids in accordance with N.J.S.A. 40A:11 et seq., for

Bid No. 2021-07-22 2021-RESTORATION & EXPANSION AT THE HISTORIC METLAR BODINE HOUSE

All necessary bid specifications and bid forms & Plans may be secured Township website at: <http://bids.piscatawaynj.org/>.

Specifications and instructions to bidders may be obtained on the Township website <http://bids.piscatawaynj.org/>. Bid documents will not be mailed. Bidders may contact the Purchasing office by E-mail only at: Purchasing@piscatawaynj.org regarding questions or additional information about the bid specifications. **By July 19, 2021 @12noon.**

Bids must be submitted to: Township of Piscataway
Purchasing Agent
455 Hoes Lane
Piscataway, NJ 08854
Phone: 732-562-2321
E-mail: purchasing@piscatawaynj.org

Guy Gaspari, Director of Public Works/Connolly & Hickey Historical Architects
Project Manager Contact Person
Department of Public works
455 Hoes Lane
Piscataway, NJ 08854
Township of Piscataway, NJ

Bids must be sealed and delivered to the Purchasing Office of the Piscataway Township ***on or before*** date and time indicated below. The outside of the envelope to bear the following information:

Title: **2021- RESTORATION AND EXPANSION OF THE HISTORIC METLAR BODINE HOUSE**
Bid No. 2021-07-22
Name of the Bidder:
Address of the Bidder:
Date: Thursday July 29, 2021
Time: **2:00 p.m.**

The bid opening process will begin on the above advertised date and time **'BROADCAST LIVE VIA ZOOM'** Administrative offices located at 455 Hoes Lane, Piscataway, NJ 08854. Bids may be submitted to the Purchasing office at the bid opening ZOOM meeting, prior to the advertised date and time. On the advertised date and time, the Purchasing Agent shall publicly receive and open all bids. **LIVE BROADCAST VIA ZOOM. No bids shall be received after the time designated in the advertisement.** (N.J.S.A. 40A:11-1 et. seq.,)The Township of Piscataway does not accept electronic (e-mail) submission of bids.

Bidders must call the purchasing office at 732-562-2321 to drop off the sealed bid. The Municipal building is closed to the public due to the Covid-19. PLEASE, MAKE SURE YOUR SEALED BID ARRIVES WAY BEFORE 2PM.

During the Covid-19 pandemic, while the statewide “State of Emergency” declaration is still in effect in according with Executive Order 107 all proposal packets will only be read and opened electronically “BROADCAST LIVE” via ZOOM Bid opening. The Municipal building is closed due to the Covid-19 restrictions. Once the bid opening is concluded bidders must call the Purchasing Agent @ 732-562-2321 to set an appointment if bidders wishes to review any of the bids.

All bids shall be kept sealed , and will be received and publicly opened on the proposal opening date and time in the Township Council Chambers using Virtual teleconferencing which can be access by logging in to zoom in the following manner:

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PLEASE, MAKE SURE YOU DROP OFF YOUR SEALED BID BY 12NOON. BID WILL BE OPENED @2PM VIA ZOOM.

July 13, 2021

There will be a pre-bid meeting on _____ . While attendance is not mandatory, all prospective bidders are strongly encouraged to attend this important meeting, which will be held in the at **2:00 p.m. @ METLAR BODINE HOUSE, 1128 RIVER ROAD, PISCATAWAY, NJ**

All bidders are required to comply with the requirements of N.J.S.A. 10:5-31 et seq., Affirmative Action Against Discrimination (N.J.A.C. 17:27-1 et seq.) An Initial Project Workforce Report will be required from the successful contractor. (Form AA-201).

Statement of Ownership Requirement: Pursuant to N.J.S.A. 52:25-24.2, Bidders shall submit a statement setting forth the names and addresses of all persons and entities that own ten percent or more of its stock or interest of any type at all levels of ownership.

Each bid shall be accompanied by a bid bond, cashier's check or certified check made payable to the Township of Piscataway, for ten percent (10%) of the amount of the total bid, however, not to exceed \$20,000.00.

Bidders are required by law to submit a Statement of Ownership Disclosure form statement setting forth the names and addresses of all persons and entities that own ten (10%) percent or more of its stock or interest of any type at all levels of ownership.

The bid package will also include other documents that must be completed and returned with the bid. Failure to comply with Instructions to Bidders and to complete and submit all required forms, may be cause for disqualification and rejection of the bid.

All contractors named in this proposal, shall possess a valid Public Works Contractor's Registration Certificate pursuant to N.J.S.A. 34:11-56.48 et seq., at the time the proposal is received by the Township of Piscataway. The Township of Piscataway reserves the right to reject any or all bids, pursuant to N.J.S.A. 40A:11-1 et. seq., and to waive any informalities that may be in the best interest of the Township.

MARIA E VALENTE-CAEMMERER

Purchasing Agent

THE TOWNSHIP OF PISCATAWAY

GUY GASPARI, PUBLIC WORK DIRECTOR/CONNOLLY & HICKEY ARCHITECTS

REQUEST FOR BIDS

PUBLIC WORKS

Bid Advertisement

The Township of Piscataway, New Jersey, hereby advertises for competitive bids in accordance with N.J.S.A. 40A:11 et seq., for

Bid No. 2021-07-22 2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE

Bid Documents and Specifications, Plans may be obtain on the Piscataway website for free of charge. www.piscatawaynj.org ; Bid documents will not be mailed, and only picked up in person, at the above office location.

Bidders should also login to the Township website at: www.piscatawaynj.org for any Addendums: Home page E-Gov, Bids, download, print the document for free. Bidders may contact the Purchasing office by E-mail only at: Purchasing@piscatawaynj.org regarding questions or additional information about the bid specifications.

Bids must be sealed and delivered to the Office of the Purchasing office of Piscataway Township *on or before* date and time indicated below. The envelope to bear the following information:

Outside of Envelope-Title: 2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE

Bid No: **2021-07-22**
Name of the Bidder:
Address of the Bidder:
Date: **THURSDAY JULY 29, 2021**
Time: **2:00 p.m.**

The bid opening process will begin on the above advertised date and time in The Township of Piscataway 455 Hoes Lane, Piscataway, New Jersey 08854. **VIA ZOOM. "BROADCAST LIVE ZOOM"** Bids must be submitted to the Purchasing Office at the bid opening meeting, prior to the advertised date and time. On the advertised date and time, the Purchasing Agent shall publicly receive and open all bids **Via ZOOM. No bids shall be received after the time designated in the advertisement.** The Township of Piscataway does not accept electronic (e-mail) submission of bids.

Bidders must call the purchasing office at 732-562-2321 to drop off the sealed bid. The Municipal building is closed to the public due to the Covid-19. PLEASE, MAKE SURE YOUR SEALED BID ARRIVES to Purchasing BY 12NOON.

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Meeting ID: 815 4097 1746

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PLEASE, MAKE SURE YOU DROP OFF YOUR SEALED BID BY 12NOON. BID WILL BE OPENED @2PM VIA ZOOM.

There will be a pre-bid /**Site Visit** meeting on **JULY 13, 2021**. While attendance is **not mandatory**, all prospective bidders are **strongly encouraged** to attend this important meeting, which will be held at the, at **2:00 p.m.@ Historic Metlar Bodine House @ 1128 River Road, Piscataway, NJ 08854**

All bidders are required to comply with the requirements of N.J.S.A. 10:5-31 et seq., Affirmative Action Against Discrimination (N.J.A.C. 17:27-1 et seq.). An Initial Project Workforce Report will be required from the successful contractor. (Form AA-201).

Contractors bidding on this project are to comply with the requirements of the New Jersey Prevailing Wage Act pursuant to N.J.S.A. 34:11-56.25 et seq.

Each bid shall be accompanied by a bid bond, cashier's check or certified check made payable to the Township of Piscataway, for ten percent (10%) of the amount of the total bid, however, not to exceed \$20,000.00.

Bidders are required by law to submit a Statement of Ownership Disclosure form statement setting forth the names and addresses of all persons and entities that own ten (10%) percent or more of its stock or interest of any type at all levels of ownership.

Statement of Ownership Requirement: Pursuant to N.J.S.A. 52:25-24.2, Bidders shall submit a statement setting forth the names and addresses of all persons and entities that own ten percent or more of its stock or interest of any type at all levels of ownership.

The bid package will also include other documents that must be completed and returned with 40A:11-1 et seq., the bid. Failure to comply with Instructions to Bidders and to complete and submit all required forms, may be cause for disqualification and rejection of the bid.

The Township of Piscataway reserves the right to reject any or all bids pursuant to N.J.S.A. 40A:11-1 et seq., and to waive any informalities that may be in the best interests of the Township.

MARIA E. VALENTE-CAEMMERER

Purchasing Agent

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Review all sections that may affect your work and include applicable requirements. All contracts are based on scope information within the whole document set and are not limited to “trade” drawings and specifications.

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BID DOCUMENTS AND REQUIRED DOCUMENTATION

Acknowledgement of Addenda

Bidder's Comment Form

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Non-Collusion Affidavit

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Statement of Ownership Disclosure Form

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Sample of Certificate Of Employee Information Report

Sample of Sate of New Jersey Business Registration Certificate

Sample of W-9

Sample of Certificate of Insurance

Sample of Bid Bond Form

Sample of Piscataway Performance Bond Form

Sample of NJ Labor Payroll Forms

Sample of NJ AA-202 Forms

Sample of NJ AA-201 Forms

Sample of –ST-13 Form

Ethics in Purchasing

Township Responsibility

Recommendation of Purchases

It is the desire of The Township of Piscataway to have all employees and officials practice exemplary ethical behavior in the procurement of goods, materials, supplies, and services.

Officials and employees who recommend purchases shall not extend any favoritism to any vendor. Each recommended purchase should be based upon quality of the items, service, price, delivery, and other applicable factors in full compliance with N.J.S.A. 40A:11-1 et seq.,

Solicitation/Receipt of Gifts – Prohibited

Officials and employees are prohibited from soliciting and receiving funds, gifts, materials, goods, services, favors, and any other items of value from vendors doing business with The Township of Piscataway or anyone proposing to do business with the Township.

Vendor Responsibility

Offer of Gifts, Gratuities -- Prohibited

Any vendor doing business or proposing to do business with The Township of Piscataway, shall neither pay, offer to pay, either directly or indirectly, any fee, commission, or compensation, nor offer any gift, gratuity, or other thing of value of any kind to any official or employee of The Township of Piscataway or to any member of the official's or employee's immediate family.

Vendor Influence -- Prohibited

No vendor shall cause to influence or attempt to cause to influence, any official or employee of the Township of Piscataway, in any manner which might tend to impair the objectivity or independence of judgment of said official or employee.

Vendor Certification

Vendors or potential vendors will be asked to certify that no official or employee of The Township of Piscataway or immediate family members are directly or indirectly interested in this request or have any interest in any portions of profits thereof. The vendor participating in this request must be an independent vendor and not an official or employee of the Township.

MARIA E. VALENTE-CAEMMERER

Purchasing Agent

Township of Piscataway

ADVISORY INFORMATION FOR BIDDERS

1. PROMPTNESS OF BID SUBMITTAL

It is the responsibility of the bidder to ensure that their bid is presented in a sealed envelope and submitted to the Purchasing Office, prior to the advertised bid date and time **Via ZOOM**. The advertised bid date and time for this bid is on **THURSDAY JULY 29, 2021 @ 2:00pm**. No bids shall be received after the time designated in the bid advertisement. No extensions or exceptions will be made. The Purchasing Office is opened Monday through Friday from 8:30am – 4:30pm and closed for lunch from 12:20pm to 1:30pm. Once again, bids will not be received after the time designated in the advertisement. Bidders must call Purchasing @732-562-2321 to hand deliver the sealed bid. The Municipal Building is closed due to the Covid-19. Bids must be dropped off by 12noon.

2. PARKING

Allow enough time to locate a parking space.

3. MAIL

Mail is brought to the Clerk's Offices in mailbags, approximately 11:30am each day. The mail is then sorted within the Township system, by departments. The Clerk's Office routinely receives its mail at approximately 11:30am.

4. UPS / FED EX / AND OTHER EXPRESS DELIVERY SERVICES

Deliveries of this type usually begin at 9:00 a.m. These items are brought only to the Clerk's Office. The Clerks Office then calls the various departments with a request to pick up their items. . **Please, Make Sure Name of the BID IS ON THE OUTSIDE OF THE FEDEX /UPS ENEVELOPE.**

5. HAND DELIVER BIDS – SUGGESTED PRACTICE

Keeping the aforementioned items in mind, the Township suggests that bidders arrange to hand deliver their bid to the Clerk's Office, and the Clerk will personally turn it in to the Purchasing Agent before the advertised date and time. Please understand that bids arriving after the advertised bid date and time, for any reason, cannot be accepted, opened or considered. . CALL 732-562-2321 to drop off the sealed bid. **PLEASE MAKE SURE YOU DROP OFF YOUR SEALED BID BY BEFORE 12NOON.**

Require: Submission of (1) Original Bid in Blue Ink and Required: (1) Photo Copy of the original marked "TRUE COPY".

Required (1) Original Bid Bond only with the Original bid packet.

All bids are to be submitted in duplicate; one (1) Original; one (1) Photo Copy of the Original Marked "TRUE COPY. No originals in the True copy

Bidders must call the purchasing office at 732-562-2321 to drop off the sealed bid. The Municipal building is closed to the public due to the Covid-19. PLEASE, MAKE SURE YOR SEALED BID ARRIVES BY 12NOON.

During the Covid-19 pandemic, while the statewide "State of Emergency" declaration is still in effect in according with Executive Order 107 all proposal packets will only be read and opened electronically "BROADCAST LIVE" via ZOOM Bid opening. The Municipal building is closed due to the Covid-19 restrictions. Once the bid opening is concluded bidders must call the Purchasing Agent @ 732-562-2321 to set an appointment if bidders wishes to review any of the bids.

All bids shall be kept sealed , and will be received and publicly opened on the proposal opening date and time in the Township Council Chambers using Virtual teleconferencing which can be access by logging in to zoom in the following manner:

Join Zoom Meeting:

Piscataway Purchasing is inviting you to a scheduled Zoom meeting.

Topic: Piscataway Bid Opening-2021-Restoration &Expansion of the Historic Metlar Bodine House

Time: July 29, 2021 02:00 PM Eastern Time (US and Canada)

Join Zoom Meeting

<https://us02web.zoom.us/j/81540971746?pwd=T1pMb2FTQmVIYWFlVmZqeWx0czNiUT09>

Meeting ID: 815 4097 1746

Passcode: 421339

One tap mobile

+16468769923,,81540971746#,,,,*421339# US (New York)

+13017158592,,81540971746#,,,,*421339# US (Washington DC)

Dial by your location

+1 646 876 9923 US (New York)

+1 301 715 8592 US (Washington DC)

+1 312 626 6799 US (Chicago)

+1 408 638 0968 US (San Jose)

+1 669 900 6833 US (San Jose)

+1 253 215 8782 US (Tacoma)

+1 346 248 7799 US (Houston)

Meeting ID: 815 4097 1746

Passcode: 421339

PLEASE, MAKE SURE YOU DROP OFF YOUR SEALED BID TO PURCHASING BY 12NOON.

Township of Piscataway

BID CHECKLIST (A)

A. Bid packages must be submitted in duplicate on the proposed forms as provided, and in the manner designated. The Township of Piscataway will accept one original bid package and one copy of the bid package. Please include all items, organized as follows:

1. Addenda, Acknowledgement
2. Americans with Disabilities Act—Acknowledgement
Bid Bond Form
3. Bid Proposal Form
4. Bid Guarantee (Bid Bond, Cashier's Check, or Certified Check)
5. Business Registration Certificate -- New Jersey—Submit with bid or prior to award of contract
6. Certificate (Consent) from Surety
7. Acceptable Bid Bond Forms
8. Contractor Questionnaire / Certification
9. Contractor's Registration Certification
10. Contractor Registration Certificate—Submit with bid or prior to award of contract
11. Equipment Certification
12. Iran Disclosure of Investment Activities
13. Non-Collusion Affidavit
14. Notice of Classification Form
15. Prequalification Affidavit—No Material Adverse Change
16. Prevailing Wages Certification
17. Statement of Ownership Disclosure
18. Subcontractor's Disclosure Statement and all required attachments for subcontractors.
19. Sworn Contractor Certification; Qualifications and Credentials
20. Bidder Comment Form - Optional
21. Bid Cover Page, with name ,address ,phone number, E-mail address
22. Hold Harmless Agreement
23. Subcontractor's forms if not applicable: WRITE **N/A** ON THE FORM AND SIGN BOTTOM OF FORM.

Failure to submit the above listed documents with the bid package may be cause for rejection of the entire bid for being non-responsive

THE TOWNSHIP OF PISCATAWAY

BID CHECKLIST (B)

B. Reminder Checklist

As a courtesy, the Office of the Purchasing Agent has prepared this reminder checklist to items pertaining to this bid. The checklist is not considered to be all-inclusive. Bidders are to read and become familiar with all instructions outlined in the bid package.

| <u>Item</u> | <u>Yes</u> | <u>No</u> |
|--|------------|-----------|
| 1. Have you verified your pricing to ensure accuracy? | | |
| 2. Have you answered every question fully and accurately? | | |
| 3. Have you signed all your documents <u>(Blue Ink)?</u> No facsimile signature. | | |
| 4. Have you prepared all documents for submission? | | |
| 5. Did you make a copy of the bid package for your records? | | |
| 6. Did you make a duplicate copy of the original bid for the Township? Marked "True Copy" | | |
| 7. Did you submit a signed Bid Guarantee? Signed Consent of Surety? | | |
| 8. Did you correctly address the envelope, title of bid? | | |
| 9. Have you allowed ample time for the bid to reach the Clerk's Office? <hr/> | | |
| 10. REQUIRED: Bid Cover Page: Name , Address, Phone Number, E-mail Address? | | |

PLEASE, MAKE SURE YOU DROP OFF YOUR SEALED BID BY 12NOON. BID WILL BE OPENED @2PM VIA ZOOM.

THE TOWNSHIP OF PISCATAWAY

2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE



GENERAL SPECIFICATIONS

Page 1- 58



MARIA E. VALENTE-CAEMMERER

Purchasing Agent

THE TOWNSHIP OF PISCATAWAY

INSTRUCTIONS TO BIDDERS

1. BIDS ARE TO BE SUBMITTED TO:

Division of Purchasing/Attention Purchasing Agent
The Township of Piscataway
455 Hoes Lane
Piscataway, New Jersey 08854

BY: **2:00 p.m.** PREVAILING TIME

ON: **THURSDAY, JULY 29, 2020**

by mail, delivery service or in person. Bids that are submitted are to be sealed and will be unsealed and announced at the bid opening meeting.

2. **Bid Packages to be submitted in Duplicate.** Bids must be placed in a *sealed* envelope/package marked as shown below on the front of the envelope/package. Bid packages must be submitted **in duplicate** on the proposed bid submittal forms as provided, and in the manner designated. The Township of Piscataway requires one original bid package, one duplicate copy of the bid package. The extra copies are necessary for processing of the bids. Bidders should also keep a complete copy of the bid packet, exactly as submitted.

| | |
|--|--|
| <u>OUTSIDE OF Envelope Label Information:</u> | Township: <u>The Township of Piscataway</u> |
| | Bid Number: <u>2021-07-22</u> |
| | Project: <u>“RESTORATION & EXPANSION AT THE HISTORIC METLAR BODINE HOUSE”</u> |
| | Bid Date: <u>THURSDAY, JULY 29, 2021</u> |
| | Bid Time: <u>2:00pm</u> |
| | Bidder: <i>Name of Company</i> <i>Address</i> <i>City, State Zip</i> |

Failure to properly label the bid envelope may be cause for the rejection of the bid.

The Township of Piscataway does not accept electronic (E-mail) submission of bids.

PLEASE, MAKE SURE YOU DROP OFF YOUR SEALED BID BY 12NOON. BID WILL BE OPENED @2PM VIA ZOOM.

3. BID OPENING MEETING

All bids will be publicly received and unsealed by the Purchasing Agent opened at the above address and read beginning at **2:00pm** on **THURSDAY, JULY 29, 2021**. Bidders and/or their authorized agents, and the general public are invited to be present at the bid opening. It is the responsibility of each bidder to ensure that their bid is complete and presented to the Purchasing Agent prior to the advertised bid date and time. No bids shall be received or accepted by The Township of Piscataway after the advertised bid date and time. . **PLEASE, MAKE SURE YOUR SEALED BID ARRIVES BY 12NOON.**

[Join Zoom Meeting:](#)

Piscataway Purchasing is inviting you to a scheduled Zoom meeting.

Topic: Piscataway Bid Opening-2021-Restoration &Expansion of the Historic Metlar Bodine House

Time: July 29, 2021 02:00 PM Eastern Time (US and Canada)

Join Zoom Meeting

<https://us02web.zoom.us/j/81540971746?pwd=T1pMb2FTQmVIYWFlVmZqeWx0czNiUT09>

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+1 669 900 6833 US (San Jose)

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Meeting ID: 815 4097 1746

Passcode: 421339

PLEASE, MAKE SURE YOU DROP OFF YOUR SEALED BID BY 12NOON. BID WILL BE OPENED @2PM VIA ZOOM.

BIDDING REQUIREMENTS

4. AFFIRMATIVE ACTION—EQUAL EMPLOYMENT OPPORTUNITY IN PUBLIC CONTRACTS--EEO

The construction contractor shall complete and submit an Initial Project Workforce Report, **Form AA-201** upon notification of award by the governing body. Proper completion and submission of this Report shall constitute evidence of the contractor's compliance with the regulations. Failure to submit this form may result in the contract being terminated. The contractor also agrees to submit a copy of the Monthly Project Workforce Report, **Form AA-202** once a month thereafter for the duration of the contract to the Department of Labor Workforce and Development and to The Township of Piscataway Public Agency Compliance Officer.

All bidders should familiarize themselves with N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27-1.1 et seq. **MANDATORY EQUAL EMPLOYMENT OPPORTUNITY LANGUAGE—EXHIBIT B.** If awarded a contract, your company/firm will be required to comply with the above requirements.

All relevant questions should be related to: Department of Treasury
 Division of Purchase and Property
 Contract Compliance and Audit Unit
 EEO Monitoring Program—PO Box 206
 Trenton, New Jersey 08625-0206
 (609) 292-5473

5. AMERICAN GOODS

In accordance with N.J.S.A. 40A:11-1 et seq., only manufactured products of the United States, wherever available, and where possible are to be used with this project.

Access to the Work and Records

The representatives of the Federal Department of Labor, the New Jersey Department of Environmental Protection and the New Jersey Department of Labor and any other governmental entity having jurisdiction shall be afforded access to the work and project records under this contract. The Contractor shall provide proper facilities for such access and inspection

6. AMERICANS WITH DISABILITIES ACT; FACILITIES FOR HANDICAPPED PERSONS

The contractor must comply with all provisions of Title II of the Americans with Disabilities Act (ADA), P.L 101-336, in accordance with 42 U.S.C. S121.01 et seq. The Township of Piscataway further recognizes that all specifications for the construction, remodeling or renovation of any public building shall provide facilities for the physically handicapped.

It is further recommended that bidders are required to read the Americans with Disabilities language form that is included in these specifications. The form shall be signed to show agreement with the provisions of Title II of the Act and the provisions are to be made a part of the contract. The signed form shall be submitted with the bid proposal. The contractor is obligated to comply with the Act and to hold the owner harmless.

7. ANTI-DISCRIMINATION PROVISIONS—N.J.S.A. 10:2-1

N.J.S.A. 10:2-1. Antidiscrimination provisions. Every contract for or on behalf of the State or any county or municipality or other political subdivision of the State, or any agency of or authority created by any of the foregoing, for the construction, alteration or repair of any public building or public work or for the acquisition of materials, equipment, supplies or services shall contain provisions by which the contractor agrees that:

a. In the hiring of persons for the performance of work under this contract or any subcontract hereunder, or for the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under this contract, no contractor, nor any person acting on behalf of such contractor or subcontractor, shall, by reason of race, creed, color, national origin, ancestry, marital status, gender identity or expression, affectional or sexual orientation or sex, discriminate against any person who is qualified and available to perform the work to which the employment relates;

b. No contractor, subcontractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employee engaged in the performance of work under this contract or any subcontract hereunder, or engaged in the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under such contract, on account of race, creed, color, national origin, ancestry, marital status, gender identity or expression, affectional or sexual orientation or sex;

c. There may be deducted from the amount payable to the contractor by the contracting public agency, under this contract, a penalty of \$50.00 for each person for each calendar day during which such person is discriminated against or intimidated in violation of the provisions of the contract; and

d. This contract may be canceled or terminated by the contracting public agency, and all money due or to become due hereunder may be forfeited, for any violation of this section of the contract occurring after notice to the contractor from the contracting public agency of any prior violation of this section of the contract.

No provision in this section shall be construed to prevent the township from designating that a contract, subcontract or other means of procurement of goods, services, equipment or construction shall be awarded to a small business enterprise, minority business enterprise or a women's business enterprise pursuant to P.L.).

8. ARCHITECT OR CONSTRUCTION DISPUTES; ALTERNATIVE DISPUTE RESOLUTION PROCESS

All disputes relating to construction contracts or relating to contracts for engineers or architects, surveyors, design or skilled services relating to construction contracts for prompt payment issues shall be submitted to the following Alternative Dispute Resolution process (“ADR”):

All disputes shall first be submitted to the architect of record, if there is one, for a determination. If thirty (30) days pass without a determination by the architect or a determination is made that does not resolve the dispute, then the claims shall be submitted for non-binding mediation by a single mediator.

The mediation shall be held where the project is located before a mediator who is mutually acceptable to the parties. The parties shall share the mediator’s fees equally. If the dispute is submitted for mediation the neutral party involved must demonstrate knowledge of the Local Public Contracts Law.

Nothing shall prevent either party from seeking injunctive or declaratory relief in court at any time.

The alternative dispute resolution practices required by this section shall not apply to disputes concerning the bid solicitation process, or to the formation of contracts.

The Bidder further agrees to include a similar provision in all agreements with independent contractors and consultants retained for the project and to require all independent contractors to include similar mediation provisions in all agreements with subcontractors, suppliers or fabricators so retained, thereby providing for mediation as the primary method for dispute resolution between the parties to those agreements. The arbitration of claims is expressly excluded under this Contract.

If the parties cannot resolve their dispute through the mediation process, the parties are free to file an action in the appropriate court of law.

****AIA- Document's will Not be accepted by The Township of Piscataway. Sample of acceptable Bid Bond Form in the bid**

9. BID GUARANTEE AND BONDING REQUIREMENTS

- A. Bid Guarantee** Bidders shall submit with their bid package a bid guarantee made payable to: The Township of Piscataway (“Township”). The guarantee shall be in the form of a certified check, cashier’s check or bid bond in the amount of 10% of the bid, but not in excess of \$20,000. Such deposit shall be forfeited upon refusal of a bidder to execute a contract. Any bid in the form of a check shall be returned when the contract is executed and surety (performance) bond filed with the Township. The bid guarantee check for unsuccessful bidders, if requested, will be returned as soon after the bid opening as possible, but in no event later than (10) days after the bid opening.

Please note: Uncertified business checks, personal checks or money orders are not acceptable.

All bid bonds submitted must be signed and witnessed with original signatures. The Township will not accept facsimile or rubber stamp signatures on the bid bond. **Failure to sign the bid bond by either the Surety or Principal, and/or failure to submit the properly executed bid bond with the bid package, shall be deemed cause for disqualification and rejection of the bid.**

The Attorney-in-Fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the Power of Attorney. The Township of Piscataway will only accept bid bonds from companies that are licensed and qualified to do business in the State of New Jersey. Such a list may be available upon request to the State of New Jersey, Department of Banking and Insurance, P.O. 040, Trenton, New Jersey 08625. **Failure to submit a properly executed bid guarantee shall be cause for disqualification and rejection of bid.**

Please note: The name, address and phone number of the Bond Underwriter as well as the Bond Number shall be included with all bonds submitted to the Township.

****AIA- Documents will Not be accepted by The Township of Piscataway. Bidders must use Township BID BOND Form in the bid.**

B. Certificate (Consent) of Surety—N.J.S.A. 40A:11-1 et seq.,

Each bidder must submit with his bid a certificate from a surety company stating that the surety company will provide the contractor with a performance bond in an amount equal to the amount of the contract (N.J.S.A. 40A-11-1 et seq.,). Such surety company must be licensed and qualified to do business in the State of New Jersey. All certificate (consent) of surety documents must be signed with original signatures.

The Township will not accept facsimile or rubberstamp signatures. The certificate (consent) of surety, together with a power of attorney must be submitted with the bid. Submission of a Consent of Surety which contains any prior conditions upon the Surety's issuance of the required Bonds (other than the award of the contract) may be cause for rejection of the bid.

Failure to sign the Certificate (Consent) of Surety by either the Surety or Principal, and/or failure to submit the properly executed Certificate (Consent) of Surety with the bid package, shall be deemed cause for disqualification and rejection of the bid.

****AIA- Documents will Not be accepted by The Township. Bidders must use Township BID BOND Form in the bid**

****AIA- Documents will Not be accepted by The Township of Piscataway. Bidders must use Township Performance Payment Bond Form in the bid(-Sample)**

C. Performance Bond--(N.J.S.A. 2A:44-143/2A:44-147)

The successful contractor shall furnish a Performance, Payment and Completion Bond in a sum of at least one hundred percent (100%) of the total amount payable by the terms of his Contract. Such written guarantee shall be made payable to the Township of Piscataway and shall be in the form required by Statute. Attached to the performance bond shall be a Surety Disclosure Statement and Certification which shall be complete in all respects and duly acknowledged according to law. A model Surety Disclosure Statement and Certification is presented in the Appendix Section of this proposal.

Such bond shall further carry a stipulation that no advance, premature, excessive or delayed payments by the Township shall in any way affect the obligation of the Surety on its bond.

Such bond shall further stipulate that no payments made to the contractor, nor partial or entire use of occupancy of the work by the Township shall be an acceptance of any work or materials not in accordance with this Contract and the Surety shall be equally bound to the same extent as the Contractor.

It is expressly stipulated that the Surety for the Contractor on the project shall be obligated to make periodic inquiries of the Township at reasonable times, to determine whether its Principal has performed or was performing the Contract in accordance with all its terms and conditions, particularly in relation to the progress payments scheduled under said Contract with the Township.

In the event the Contractor defaults or fails to perform or finish the work prescribed under the Contract for any reason whatsoever, it shall become the unqualified obligation the Surety for the defaulting contractor to complete the Contract in accordance with its terms following receipt of notice from the Township of such default.

The Township shall only accept one payment and performance bond to cover this public works contract. The performance bond shall contain language as found in N.J.S.A. 2A:44-14. The bond form language is presented in the Appendix Section of this proposal.

Such Performance, Payment and Completion Bond shall be executed and delivered to The Township of Piscataway when so requested by the Notice to Proceed Letter or within ten (10) days after the award of contract.

The Township of Piscataway will only accept performance bonds from surety companies that are licensed and qualified to do business in the State of New Jersey, and if the amount of the bond is \$850,000 but not more than \$3.5 million, the surety shall hold a current certificate of authority, issued by the United States Secretary of the Treasury pursuant to 31 U.S.C. 9305. (N.J.S.A. 2A:44-143 (b))

Please note: The name, address, and phone number of the Bond Underwriter as well as the Bond Number shall be included with all bonds submitted to The Township of Piscataway and must be duly signed with original signatures.

When applicable, for multi-year contracts and for extension of contracts, the Performance Bond may be re-submitted each year on the contract anniversary date for one hundred per cent (100%) of the contract amount.

****AIA- Documents will Not be accepted by The Township of Piscataway. Bidders must use Township Performance Payment Bond Form in the bid. (-SAMPLE)**

10. BID PROPOSAL FORM

All bids are to be written in by typewriter or ink in a legible manner on the official Bid Proposal Form. Any bid price showing any erasure or alteration must be initialed by the bidder in ink, at the right margin next to the altered entry. Failure to initial any erasure or alteration may be cause to disqualify that particular bid entry. If the disqualified entry is a required one, the entire bid may be subject to rejection, so please fill out all entries with care.

Business Organization

Each Bid Proposal Form must give the full business address, business phone, fax, e-mail, the contact person of the bidder, and be signed by an authorized representative as follows:

- Bids by partnerships must furnish the full names of all partners and must be signed in the partnership name by one of the members of the partnership or by an authorized representative, followed by the signature and designation of the person signing.
- Bids by corporations must be signed in the legal name of the corporation, followed by the name of the State in which incorporated and must contain the signature and designation of the president, secretary or other person authorized to bind the corporation in the matter.
- Bids by sole-proprietorship shall be signed by the proprietor.
- When requested, satisfactory evidence of the authority of the officer signing shall be furnished.

The Bid Proposal Form must be duly signed by the authorized representative of the company, at the end of the Bid Proposal Form. **Failure to sign in [Blue Ink](#) the Bid Proposal Form may be cause to disqualify the entire bid.** If the Bid Proposal Form contains more than one sheet, then bidders are requested to affix the company name and address on each intervening sheet between the front sheet and the signature sheet which already bear the company information.

The Township of Piscataway will not consider any bid on which there is any alteration to, or departure from, the bid specifications. Bidders are not to make any changes on the Bid Proposal Form, or qualify their bid with conditions differing from those defined in the contract documents. If bidders do make changes on the Bid Proposal Form, except as noted above for initialed clerical mistakes, it may be cause to disqualify that particular bid as non-responsive. (N.J.S.A. 40A:11-1 et seq.,)

The bidder also conveys by submitting a bid that the company he represents is financially solvent, experienced in and competent to perform the type of work so specified.

BID RESULTS. Preliminary bid results you can E-mail purchasing@piscatawaynj.org generally within **24-36 hours after date and time of bid opening**

11. BIDDER COMMENT SHEET

This form is for the Bidder's use in offering voluntary alternates, or other comments intended to afford the Township information or opportunities to improve the quality of the project, without invalidating the bid proposal. It may *not* be used to take exception to specific conditions of the project defined in the contract documents which the Bidder does not like. The bid provided must be based upon the plans and specifications, and all contract conditions, as stated. If these documents or conditions contain some untenable item, or extremely expensive provision, for example, to which the Bidder wishes to raise objection, this must be done at the pre-bid meeting, or in writing to the Purchasing office at: Purchasing@piscatawaynj.org through the question process outlined in the Instructions to Bidders. Such inquiries will have response issued by addendum only, and the resulting decision circulated to all bidders of record.

12. BIDDER'S RESPONSIBILITY FOR BID SUBMITTAL

It is the responsibility of the bidder to ensure that their bid is presented to The Township of Piscataway and officially received before the advertised date and time of the bid. It is understood and agreed upon that any person in The Township of Piscataway will be absolved from responsibility for the premature opening of any bid not properly labeled and sealed. Failure to properly label the bid envelope may be cause for the rejection of the bid. **PROPERLY NAME OF THE BID: OUTSIDE OF THE ENVELOPE MUST BE LABEL CLEAR.**
ON YOUR FEDEX OR UPS ENVELPPE THE NAME OF THE BID MUST BE ON THE OUTSIDE.

Reference to General Requirements and Special Conditions

The attention of bidders is specifically directed to the General Requirements, and the Special Conditions of the specifications

BID SUBMITTAL. Bids may be hand delivered or mailed per legal Notice by Bidders. In the case of mailed bids, the Township of Piscataway will **not** assume any responsibility for bids lost in transit at any time before bid opening. All bids received after the designated date and time will be returned unopened to the bidder.

QUESTIONS REGARDING PLANS & SPECIFICATIONS. Should any bidder be in doubt as to the intent of the Plans and Specifications, he should immediately notify the Purchasing Agent in writing by E-mail to : Purchasing@piscatawaynj.org , who will send a written addendum to all bidders covering the point in question. Bidders may not rely upon oral before submitting bids, the bidder shall apply in writing to the Purchasing Agent for clarification or interpretation of any conflicting information between two or more statements in the Plans and Specifications. If such clarification is not requested seven business days before bidding, the bidder shall be responsible for doing such work and furnishing such materials, as is necessary to comply with whichever interpretation of the Plans and Specifications the Engineer may, during construction, judge to be proper. . Question to be E-mailed to Purchasing@piscatawaynj.org

13. BUSINESS REGISTRATION CERTIFICATE (N.J.S.A. 52:32-44)

Pursuant to N.J.S.A. 52:32-44 as amended, a contractor shall provide the contracting agency with the business registration of the contractor and that of any named subcontractor prior to the time a contract, purchase order, or other contracting document is awarded or authorized. At the sole option of the contracting agency, the requirement that a contractor provide proof of business registration may be fulfilled by the contractor providing the contracting agency sufficient information for the contracting agency to verify proof of registration of the contractor, or named subcontractors, through a computerized system maintained by the State.

Request of the Township

All bidders or companies providing responses for requested proposals, are **requested** to submit with their response package a copy of their "New Jersey Business Registration Certificate" as issued by the Department of Treasury of the State of New Jersey.

The Township reminds all respondents that failure to submit the New Jersey Business Registration Certificate prior to the award of contract will result in the rejection of the proposal.

A subcontractor named in a bid or other proposal made by a contractor to a contracting agency shall provide a copy of its business registration to any contractor who shall provide it to the contracting agency pursuant to the provisions of subsection b. of this section. No contract with a subcontractor shall be entered into by any contractor under any contract with a contracting agency unless the subcontractor first provides the contractor with proof of a valid business registration.

The contractor shall maintain and submit to the contracting agency a list of subcontractors and their addresses that may be updated from time to time during the course of the contract performance. A complete and accurate list shall be submitted before final payment is made for goods provided or services rendered or for construction of a construction project under the contract. A contracting agency shall not be responsible for a contractor's failure to comply with this subsection.

A contractor or a contractor with a subcontractor that has entered into a contract with a contracting agency, and each of their affiliates, shall collect and remit to the Director of the Division of Taxation in the Department of the Treasury the use tax due pursuant to the "Sales and Use Tax Act," P.L.1966, c.30 (C.54:32B-1 et seq.) on all their taxable sales of tangible personal property delivered into this State.

STATE OF NEW JERSEY
BUSINESS REGISTRATION CERTIFICATE
FOR STATE AGENCY AND CASINO SERVICE CONTRACTORS

DEPARTMENT OF TREASURY
 DIVISION OF REVENUE
 PO BOX 252
 TRENTON, N.J. 08646-0252


TAXPAYER NAME: TAX REGISTRATION TEST ACCOUNT
 TAXPAYER IDENTIFICATION#: 970-097-382/500
 ADDRESS: 847 ROEBLING AVE
 TRENTON NJ 08611
 EFFECTIVE DATE: 01/01/01
 FORM-BRC(08-01)

TRADE NAME: CLIENT REGISTRATION
 SEQUENCE NUMBER: 0107330
 ISSUANCE DATE: 07/14/04

John S. Tully
 Acting Director

This Certificate is NOT assignable or transferable. It must be conspicuously displayed at above address.

SAMPLES OF
NEW JERSEY
BUSINESS REGISTRATION
CERTIFICATES

 **STATE OF NEW JERSEY**
BUSINESS REGISTRATION CERTIFICATE

Taxpayer Name: TAX REG TEST ACCOUNT
 Trade Name:
 Address: 847 ROEBLING AVE
 TRENTON, NJ 08611
 Certificate Number: 1093907
 Date of Issuance: October 14, 2004

For Office Use Only:
 20041014112823533

N.J.S.A. 54:49-4.1: Violations of Registration Requirements; Penalties.

A business organization that fails to provide a copy of a business registration as required pursuant to section 1 of P.L.2001, c.134 (C.52:32-44 et al.) or subsection e. or f. of section 92 of P.L.1977, c.110 (C.5:12-92), or that provides false information of business registration under the requirements of either of those sections, shall be liable for a penalty of \$25 for each day of violation, not to exceed \$50,000 for each business registration copy not properly provided under a contract with a contracting agency or under a casino service industry enterprise contract.

14. CHALLENGES TO BID SPECIFICATIONS (N.J.S.A. 40A:11-1 et seq.,)

Any prospective bidder who wishes to challenge a bid specification shall file such challenges in writing with the Purchasing Agent no less than three (3) days prior to the opening of bids. Challenges filed after that date shall be considered void and having no impact on The Township of Piscataway or the award of a contract.

15. CHANGE ORDERS (N.J.A.C. 6A:26-4.9, 4.10 et seq.) (N.J.A.C. 5:30-11.1 et seq.)

The Township Approval Required; Prior to Issuance of Change Order (N.J.A.C. 5:30-11.2)

Change orders may be approved by The Township of Piscataway in an amount up to twenty percent (20%) when necessitated by one of the following:

- Emergencies consistent with N.J.S.A. 40A:11-1 et. Seq.;
- Unforeseeable physical conditions; or
- Minor modification to the project/scope that achieve cost savings, improve service or resolve construction conditions.

Contractors are prohibited to perform any change order unless so directed in writing by the Township, Office of the Purchasing Agent. Project Manager must have Resolution and Certified Funds by CFO/Director of Finance for any Change Orders. No work can be started by the Contractor without a Resolution and Certified Funds, Executed Change Order Contract.

16. CONTRACTS

A. Award of Contract; Rejection of Bid

The contract shall be awarded, if at all, to the lowest responsible bidder as determined by the Township. The Township of Piscataway reserves the right to reject any or all bids as authorized by the Local Public Contracts Law, and to waive any informalities the Township feels are in the best interests of the Township.

Award the Contract or Reject All Bids--Sixty (60) Days

Pursuant to N.J.S.A. 40A:11-1 et seq., The Township of Piscataway shall award the contract or reject all bids within sixty (60) days of the advertised date and time, except that bids of any bidders who consent thereto may, at the request of the Township, be held in consideration for such longer period as may be agreed.

B. Equal Prices

Pursuant to the statute when two or more bidders submit equal prices and the prices are the lowest responsible bids, the Township may award the contract to the vendor whose response, in the discretion of the Township, is the most advantageous, price and other factors considered.

EQUAL OR TIE BID. The Township of Piscataway reserves the right to award at their discretion, in the best interest of the Township and with reference to the information submitted with the proposals, to any of the tie bidders.

UNIT PRICES. All unit prices, and all lump sum prices, in the bid proposal shall include all applicable fees, cost, and tax (if any) relating to project, and all charges for overhead, profit, insurance, etc. The successful bidder will not be responsible for real property tax on any property of the Owner, including the site of the project. Bid proposal amount will exclude all Federal Excise Tax and sales tax of all states, except those if any.

PRICING ERROR. If a pricing error is discovered after bid opening between the unit price and the total extended price, the unit price shall prevail.

RIGHTS RESERVED BY TOWNSHIP. The Township reserves the right to reject any and all bids, to waive any informalities or irregularities in the bids received, and to accept any bid which is deemed most favorable to the Township of Piscataway, New Jersey, at the time and under the conditions stipulated. Proposals incorporating deviations which, in the judgment of the Purchasing Agent, are a clear departure from the intent and purpose of these specifications will not be considered.

C. Return of Contracts and Related Contract Documents

Upon written notification of award of contract by the Township, the contractor shall sign and execute a formal contract agreement between the township and Contractor and return the executed contracts along with:

1. Performance Bond in the total amount of the contract.
2. Insurance Certificate with The Township of Piscataway named as an additional insured.
3. Affirmative Action Form AA-201 - Initial Project Workforce Report - Yellow copy.
4. Other required documents as may be outlined in bid specifications.

The above documents may also be required for submission with the official Notice to Proceed. The contracts and related documents shall be returned to the Office of the Purchasing Agent within **ten (10) days of receipt of notification**. Failure to execute the contract and return said contract and related required documents within the prescribed time may be cause for the annulment of award by the Township with the bid security becoming property of the Township.

D. Alterations of Contract

The Township of Piscataway reserves the right to alter or amend the contract by adding to or subtracting from the work herein specified, such additions or omissions being done under the general conditions of these specifications and the terms of the Contract. No changes shall be permitted from the specifications except that the same be in writing and the amount of the extra compensation or credit stipulated therein. Refer to Change Order Section.

E. Term of Contract

The contractor, to whom the contract is awarded, will be required to do and perform the work/services and to provide and furnish the materials in connection therewith in accordance with the plans and specifications on or before the date listed in the Technical Specifications.

TERM/COMPLETION OF PROJECT AS PER SPECIFICATION/PROPOSAL PAGES

F. Purchase Order Required

No contractor shall commence any public works project until he is in receipt of an approved purchase order authorizing work to begin. (See Notice (Authorization) to Proceed)

17. CONTRACTOR'S REGISTRATION EVIDENCE

A. Valid Certificate – Receipt of Bid

All contractors must adhere to the provisions of the Public Works Contractor Registration Act – N.J.S.A. 34:11-56.48 et seq. The PWCRA requires that *“No contractor shall bid on any contract for public work . . . unless the contractor is registered pursuant to this act.”* The law requires that all contractors and sub-contractors named in the proposal possess a valid certificate at the time the proposal is received by the contracting unit, in this case the Township.

B. Submission of Certificate – Receipt of Bid--Requested; Prior to Award--Mandatory

All bidders **are requested** to submit with the bid package a current Public Works Contractor Registration Certificate that was issued prior to the receipt of the bid.

The contractor who most likely is to be considered for the contract award, must submit a copy of the current Public Works Contractor Registration Certificate, and if applicable, copies of certifications of all listed subcontractors, prior to the award of contract. **If the successful contractor fails to provide copies of certificates prior to the award of contract, the bid may be rejected as non-responsive.**

For more information contact:

Contractor Registration Unit
Division of Wage and Hour Compliance
New Jersey Department of Labor & Workforce Development
PO Box 389
Trenton, New Jersey 08625-0389
Tel: 609-292-9464
Fax: 609-633-8591
E-mail: wage.hour@dol.nj.gov
Website: lwd.dol.state.nj.us/labor/wagehour/content/contact_us.html

18. CONTRACTOR/VENDOR REQUIREMENTS—OFFICE OF THE NEW JERSEY STATE COMPTROLLER

Contractors/vendors doing business with The Township of Piscataway are reminded of the following legal requirements pertaining to the Office of the New Jersey State Comptroller:

A. Access to Relevant Documents and Information—N.J.S.A. 52:15C-14 (d)

Private vendors or other persons contracting with or receiving funds from a unit in the Executive branch of State government, including an entity exercising executive branch authority, independent State authority, public institution of higher education, or unit of local government or the township shall upon request by the State Comptroller provide the State Comptroller with prompt access to all relevant documents and information as a condition of the contract and receipt of public monies. The State Comptroller shall not disclose any document or information to which access is provided that is confidential or proprietary. If the State Comptroller finds that any person receiving funds from a unit in the Executive branch of State government, including an entity exercising executive branch authority, independent State authority, public institution of higher education, or unit of local government or the township refuses to provide information upon the request of the State Comptroller, or otherwise impedes or fails to cooperate with any audit or performance review, the State Comptroller may recommend to the contracting unit that the person be subject to termination of their contract, or temporarily or permanently debarred from contracting with the contracting unit.

B. Maintenance of Contract Records—N.J.A.C. 17:44-2.2

Relevant records of private vendors or other persons entering into contracts with covered entities are subject to audit or review by OSC pursuant to N.J.S.A. 52:15C-14(d).

The contractor/vendor to whom a contract has been awarded, shall maintain all documentation related to products, transactions or services under this contract for a period of five years from the date of final payment. Such records shall be made available to the New Jersey Office of the State Comptroller upon request.

19. DEBARMENT, SUSPENSION, OR DISQUALIFICATION – (N.J.A.C. 17:19-1.1 et seq.)

The Township of Piscataway will not enter into a contract for work with any person, company or firm that is on the State Department of Labor and Workforce Development; Prevailing Wage Debarment List, or the State of New Jersey Consolidated Debarment Report (www.state.nj.us/treasury/debarred) or the Federal System for Award—SAM.gov.

All bidders are required to submit a sworn statement indicating whether or not the bidder is, at the time of the bid, included on the State Department of Labor and Workforce Development; Prevailing Wage Debarment List or the State of New Jersey Consolidated Debarment Report, or the Federal Debarred Vendor List--Excluded Parties List System, through the System for Award Management portal—SAM.gov.

20. DOCUMENTS, MISSING/ILLEGIBLE

The bidder shall familiarize himself with all forms provided by the Township that are to be returned with the bid. If there are any forms either missing or illegible, it is the responsibility of the bidder to contact the Purchasing Agent during regular business hours or the **Guy Gaspari, Director of Public Works** as outlined in the bid advertisement for duplicate copies of the forms. This must be done before the bid date and time. The Township accepts no responsibility for duplicate forms that were not received by the bidder in time for the bidder to submit with his bid.

***Forms provided by The Township of Piscataway that must be returned with bid are referenced in the proceeding checklist.**

21. DOCUMENT SIGNATURES – ORIGINAL; BLUE INK

All documents returned to the Township shall be signed in ink (blue) with an original signature. Failure to sign and return all required documents with the bid package may be cause for disqualification and for the bid to be rejected pursuant to N.J.S.A 40A:11-1 et seq., (non-responsive). The Township will not accept facsimile or rubber stamp signatures.

Checklist of Required Documents (Forms Provided in Bid Package)

| |
|---|
| • Acknowledgement of Addenda |
| • Americans with Disabilities Act |
| • Bid Proposal Form |
| • Bidder Comments Form--optional |
| • Bid Cover Sheet, Name, Address, Phone Number, E-mail Bid Bond Form-Piscataway Form only |
| • Contractor Questionnaire/Certification |
| • Contractor’s Registration Certification |
| • Equipment Certification Exhibit “B” Hold Harmless Bidders Affidavit Plan & Experience |
| • Iran Disclosure of Investment Activities |
| • Non-Collusion Affidavit |
| • Prequalification Affidavit |
| • Prevailing Wages Certification |
| • Statement of Ownership Disclosure |
| • Subcontractor’s Disclosure Statement |
| • Sworn Contractor Certification; Qualifications and Credentials |

Please check your bid package for these forms!

Reminder – Original Bid and One True Copy of Bid Package

Bid packages are to be submitted in duplicate on the proposed forms as provided and the manner designated. The Township of Piscataway will accept one original bid package, one true copy of the bid package.

22. EQUIPMENT CERTIFICATION (N.J.S.A. 40A:11-1 et seq.,)

Each bidder shall provide a certification showing that he owns, leases or controls all the necessary equipment required by the specifications. If the bidder is not the actual owner or lessee of any such equipment, he shall submit a certificate stating the source from which the equipment will be obtained and shall obtain a certificate from the owner and person in control of the equipment, definitely granting to the bidder the control of the equipment required during such time as may be necessary for the completion of that portion of the contract for which it is necessary.

The certificates are to be submitted with the bid. If the contract involves the installation of a manufactured system which requires the contractor to have special knowledge or training, or to be specifically certified by the manufacturer to install their system, this form is used to submit such required evidence of the bidder's approval from the manufacturer.

23. EXAMINATION OF SPECIFICATIONS, ACKNOWLEDGEMENT

The bidder, by submitting a proposal, acknowledges that he has carefully examined the bid specifications, documents, addenda (if any), and the site; and that from his investigation, he has satisfied himself as to the nature and location of the work, the general and local conditions and all matters which may in any way affect the work or its performance, and that as a result of such examination, he fully understands the intent and purpose thereof, his obligations thereunder, and that he will not make any claim for, or have any right to damages, because of the lack of any information.

Each bidder submitting a bid for a service contract shall include in his bid price all labor, materials, equipment, services, and other requirements necessary, or incidental to, the completion of the work, and other pertinent work as hereinafter described, in accordance with the bid specifications and documents.

Quality of Materials and Workmanship

The attention of bidders is directed to the exacting requirements of the Contract requiring the Contractor to provide safe, watertight and otherwise adequate structures. The bidder shall realize fully that the first class materials and workmanship specified must be supplied in full measure in order to produce acceptable structures and equipment of the kind specified and as designed to give uninterrupted service for an extended period. As per Specifications.

TERM/COMPLETION OF PROJECT AS PER SPECIFICATIONS/PROPOSAL PAGES

24. FALSE MATERIAL REPRESENTATION/TRUTH IN CONTRACTING

A person commits a crime if the person knowingly makes a material representation that is false in connection with the negotiation, award or performance of a government contract. If the contract amount is for \$25,000.00 or above, the offender is guilty of a crime of the second degree. If the contract amount exceeds \$2,500.00, but is less than \$25,000.00, the offender is guilty of a crime of the third degree. If the contract amount is for \$2,500.00 or less, the offender is guilty of a crime of the fourth degree.

Bidder should be aware of the following statutes that represent “Truth in Contracting” laws:

- N.J.S.A. 2C:21-34, et seq. governs false claims and representations by bidders. It is a serious crime for the bidder to knowingly submit a false claim and/or knowingly make material misrepresentation.
- N.J.S.A. 2C:27-10 provides that a person commits a crime if said person offers a benefit to a public servant for an official act performed or to be performed by a public servant, which is a violation of official duty.
- N.J.S.A. 2C:27-11 provides that a bidder commits a crime if said person, directly or indirectly, confers or agrees to confer any benefit not allowed by law to a public servant.
- Bidder should consult the statutes or legal counsel for further information.

25. FORCE MAJEURE

Neither party shall be liable in damages for any failure, hindrance or delay in the performance of any obligation under this Agreement if such delay, hindrance or failure to perform is caused by conditions beyond the control of either party, including, but not limited to, Acts of God, flood, fire, war or the public enemy, explosion, government regulations whether or not valid (including the denial or cancellation of any export or other necessary license), court order, state funding, or other unavoidable causes beyond the reasonable control of the party whose performance is affected which cannot be overcome by due diligence.

Vendors, and/or contractors who have a contract with The Township of Piscataway to provide goods or services cannot unilaterally claim an increase in the cost of the contract because of Force Majeure.

26. INSURANCE AND INDEMNIFICATION

The bidder to whom the contract is awarded for any service work or construction work shall secure, pay the premiums for and keep in force until the contract expires, insurance of the types and amounts listed as listed:

| | |
|---|---|
| General Liability | \$2,000,000. General Aggregate |
| | \$1,000,000. Products |
| | \$1,000,000. Bodily Injury Property Damage & Personal Injury Combined |
| | \$1,000,000. Each Occurrence |
| | \$ 100,000 Pollution Cleanup |
| | \$ 50,000. Fire Damage |
| | \$ 5,000. Medical Expense |
| Excess Umbrella Liability | \$4,000,000 |
| | \$1,000,000 Sexual Harassment |
| Comprehensive Automobile Liability Coverage | \$1,000,000 Combined Single Limit Bodily Injury/Property Damage |

(A) Insurance Certificate – When Required

- The contractor shall present to The Township of Piscataway an insurance certificate in the above types and limits before any work or service begins.
- Automobile liability insurance coverage shall be included for any vehicle used by the contractor.
- The certificate holder shall be as follows:

The Township of Piscataway
c/o Office of the Purchasing Agent
455 Hoes Lane
Piscataway, New Jersey 08854

Additional Insured Clause-- The contractor must include the following clause on the insurance certificate.

“The Township of Piscataway is named as an additional insured”

OTHER INSURANCES

WORKERS COMPENSATION Evidence of adequate Workers Compensation Insurance as required by the laws of the State of New Jersey and the United States, must be available for perusal. The minimum limits are the following, unless a greater amount is required by law:

| | |
|---------------------------|----------------------------|
| Bodily Injury by Accident | \$1,000,000. Each Accident |
| Bodily Injury by Disease | \$1,000,000. Policy Limit |
| Bodily Injury by Disease | \$1,000,000. Each Employee |
| Contract Liability | Same as General Liability |

(B) Indemnification

The contractor shall assume all risk of and responsibility for, and agrees to indemnify, defend, and save harmless the Township and its agents, employees and Township members, from and against any and all claims, demands, suits, actions, recoveries, judgments and costs and expenses (including, but not limited to, attorney's fees) in connection therewith on account of the loss of life or property or injury or damage to any person, body or property of any person or persons whatsoever, which shall arise from or result directly or indirectly from the work and/or materials supplied under this contract or the performance of services by the contractor under the agreement or by a party for the whole contract is liable. This indemnification obligation is not limited by, but is in addition to, the insurance obligations contained in this agreement.

The Contractor is to assume all liability of every sort incident to the work, including property damage caused by him or his men or by any subcontractor employed by him or any of the subcontractor's men.

(C) Builders Risk Applicable Not Applicable

The contractor shall obtain and pay for within their bid, a Builder's Risk Policy providing coverage for all risk of physical loss or damage to the property in an amount equal to the total project value, less excavations and foundations.

The policy must be maintained for the duration of the project from the beginning of construction until:

- (i) written acceptance by **Guy Gaspari**, Director of Public Works, Piscataway Metlar Historic Bodine House or substantial completion, and
- (ii) a temporary certificate of occupancy or certificate of occupancy has been issued.

A copy of the policy must be delivered to The Township of Piscataway before construction begins. All of the contractor's policies, with the exception of workers' compensation, shall be endorsed naming the Township, its elected and appointed officials, and employees as additional insureds.

27. INTERPRETATIONS AND ADDENDA (N.J.S.A. 40A:11-1 et seq.,)

No interpretation of the meaning of the specifications will be made to any bidder orally. Every request for such interpretations should be made in writing to the Purchasing Agent or **Guy Gaspari, Director of Public Works/Connolly & Hickey Architect** of Record and must be received by same at least ten (10) business days, not including Saturdays, Sundays and holidays, prior to the date fixed for the opening of bids to be given consideration. Any and all interpretations and any supplemental instructions will be distributed in the form of written addenda to the specifications. The addenda will be provided by The Township of Piscataway in accordance with N.J.S.A 40A:11-1 et. Seq. to the bidder by E-mail , certified fax or delivery service, no later than seven (7) days, not including Saturdays, Sundays, or holidays prior to the date for acceptance of the bids. All addenda so issued shall become part of the contract document.

ADDENDA. It shall be understood that any addendum issued from time to time to provide additional information to the bidders shall become an integral part of this bid package. Receipt of Addendum shall be acknowledged by the bidders in the space provided therefore on the "Bid Proposal Form: Bidders log into Township website for Addendums. www.piscatawaynj.org

28. IRAN DISCLOSURE OF INVESTMENT ACITIVITIES- (N.J.S.A. 40A:11-1 et seq.,)

The Township of Piscataway, pursuant to N.J.S.A. 40A:11-1 et. Seq. shall implement and comply with Public Law 2012, c.25, Disclosure of Investment Activities in Iran—N.J.S.A. 52:32-55 et seq.

Pursuant to Public Law 2012, c. 25, any person or entity that submits a bid or proposal or otherwise proposes to enter into or renew a contract, must complete a certification attesting, under penalty of perjury, that neither the person or entity, nor any of its parents, subsidiaries, or affiliates, is identified on the Department of Treasury’s Chapter 25 list as a person or entity engaging in investment activities in Iran.

The Chapter 25 list is found on the Divisions website

<http://www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf>.

If the Township determines that a person or entity has submitted a false certification concerning its engagement in investment activities in Iran under section 4 of P.L.2012, c.25 (C.52:32-58), the Township shall report to the New Jersey Attorney General the name of that person or entity, and the Attorney General shall determine whether to bring a civil action against the person to collect the penalty prescribed in paragraph (1) of subsection a. of section 5 of P.L.2012, c.25 (C.52:32-59).

In addition, bidders must provide a detailed, accurate and precise description of the activities of the bidding person/entity, or one of its parents, subsidiaries or affiliates, engaging in the investment activities in Iran outlined above by completing the boxes on the lower portion of the enclosed form.

The Township has provided within the specifications, a Disclosure of Investments Activities certification form for all persons or entities, that plan to submit a bid, respond to a proposal, or renew a contract with the Township, to complete, sign and submit with the proposal.

JANUARY 29, 2021 UPDATE IRAN INVESTMENTS DISCLOSURE DOCUMENT FOR BIDS DOCUMENTS

Subject: Iran Investment Disclosure Now Pre-Award

Effective January 29, 2021, P.L. 2021, c. 4 amends the law requiring vendor and contractor disclosure of investment activities in Iran. The law allows the Iran investment disclosure form to be submitted prior to contract award and at the time the contract is renewed rather than with the bid or RFP submission. Although the law refers to State contracts, it also applies to contracting units subject to the Local Public, Public School, and County College Contracts Laws because N.J.S.A. 40A:11-2.1; 18A:18A-49.4; and 18A:64A-25.43, respectively, require these contracting units to follow the Iran disclosure procedure for State contracts. Contracting units are encouraged to review the new law with legal counsel and revise their procurement forms as necessary.

Failure to complete, sign, certify and submit the Disclosure of Investment Activities in Iran form with the bid/proposal shall be cause for rejection of the proposal.

29. LIABILITY – COPYRIGHT

The contractor (vendor) shall hold and save the Township, its officials and employees, harmless from liability of any nature or kind for or on account of the use of any copyrighted or un-copyrighted composition, secret process, patented or unpatented invention, article or appliance furnished or used in the performance of his contract.

30. LIQUIDATED DAMAGES

The contractor agrees to substantially complete this public works project to the complete satisfaction of The Township of Piscataway by the stated contract completion date or within the number of working days so specified in the contract.

Failure to complete the project within the specified time frame or contract completion date shall lead to The Township of Piscataway assessing liquidated damages against the contractor in accordance with and pursuant to N.J.S.A. 40A:11-1 et. seq.

For each calendar day thereafter that the work included under this contract remains uncompleted in accordance with the provision of the contract or not completed to the satisfaction of the Township, the Township shall assess liquidated damages as follows:

| <u>Amount of Contract</u> | <u>Liquidated Damages</u> |
|-----------------------------------|----------------------------|
| <u>Range of Amount</u> | |
| \$ 20,000 and less than \$ 50,000 | \$ 200.00 per calendar day |
| 50,001 and less than \$ 100,000 | 300.00 per calendar day |
| 100,001 and less than \$ 250,000 | 500.00 per calendar day |
| 251,001 and less than \$ 500,000 | 1,000.00 per calendar day |
| 500,000 and less than \$1,000,000 | 2,000.00 per calendar day |
| 1,000,000 and over | 2,500.00 per calendar day |

The Township may assess liquidated damages by deducting the amount from monies which may due or become due to the contract.

The Township may also assess the contractor additional damages for costs the Township may incur because each day the project remains uncompleted. These costs include but are not limited to:

- Construction management fees
- Architect/engineer fees
- administrative costs
- Any inspector or inspectors necessarily employed by The Township of Piscataway on the work, for any number of days in excess of the number allowed in the specifications

The Township of Piscataway may also assess against all monies owed to the contractor, liquidated damages for the violation of any terms and conditions of the contract or agreement by the contractor or the failure to perform said contract or agreement in accordance with its terms and conditions or the terms or conditions of the “Local Public Contracts Law,” in accordance with and pursuant to N.J.S.A. 40A:11-1 et seq.,

31. MAINTENANCE BONDS **Required** **not Required** When required by the Township, the contractor shall furnish a Maintenance Bond for the total sum of the contract price, indemnifying The Township of Piscataway against defects in construction for a period of **Two (2) years** after the completion of the work, general wear and tear excepted.

The condition of this obligation is such that if the successful contractor shall indemnify and hold harmless The Township of Piscataway from and against all losses, costs, damages and expenses, whatsoever, which the Township may suffer or compelled to pay by reason of the failure of the successful contractor to indemnify the Township against defects in construction for a period of **Two (2) years** after the completion of the work.

32. NON-COLLUSION AFFIDAVIT (N.J.S.A. 52:34-15)

A notarized Non-Collusion Affidavit shall be submitted with the bid/proposal. The bidder/respondent has to certify that he has not directly or indirectly, entered into any agreement, participated in any collusion, discussed any or all parts of this proposal with any potential bidders, or otherwise taken any action in restraint of free, competitive bidding in connection with the above named bid, and that all statements contained in said Proposal and in this affidavit are true and correct, and made with full knowledge that The Township of Piscataway relies upon the truth of the statements contained in said Proposal and in the statements contained in this affidavit in awarding the contract for the said bid.

The respondent has to further warrant that no person or selling agency has been employed or retained to solicit or secure such contract upon an agreement or understanding for a commission, percentage, brokerage or contingent fee, except bona fide employees of bona fide established commercial or selling agencies maintained by the respondent.

The Township of Piscataway has provided a Non-Collusion Affidavit form here within the specifications package. All respondents are to complete, sign, have the signature notarized and submit the form with the proposal response.

Failure to submit the Non-Collusion Affidavit with the proposal may be cause for the disqualification of the proposal.

33. NOTICE (AUTHORIZATION) TO PROCEED

The contractor shall not perform any work, or provide any services, materials, supplies until a Notice (Authorization) to Proceed is received from the Office of the Purchasing Agent

The Township of Piscataway only recognizes the receipt by the contractor of an approved signed purchase order as a Notice to Proceed. No word of mouth, phone, fax, e-mail, letter or other form of communication to proceed is a valid Notice to Proceed.

It is the intention of the Township to officially notify the Contractor, to whom the contract was awarded, through a Notice to Proceed letter issued by the Purchasing Agent. A purchase order will accompany the Notice to Proceed letter. The contractor shall submit certain documents to the Township as so requested in the Notice to Proceed letter.

34. Pre-Construction and Construction Conferences

Before construction is started, preconstruction conferences shall be held. During the first conference The Township of Piscataway Project Manager, his Engineer, Administrator, Purchasing Agent and the Contractor will discuss the procedures to be followed by the Contractor during the construction process. The Contractor will also be required to attend a preconstruction conference attended by all utility companies and State and local authorities. During the construction, job meetings shall be held at frequent intervals to review construction and restoration progress and to resolve difficulties which might delay completion of the work. Attendees at these meetings shall include representatives of the Township of Piscataway Project Manager, the Engineer, Administrator and Purchasing Agent and the Contractor. A Notice to Proceed must be sent to the awarded Contractor by the Project Manager. A Copy of the Notice to Proceed must be submitted to the Purchasing Agent.

34. PAYMENTS

Every effort will be made to pay vendors and contractors within thirty (30) to sixty (60) days provided The Township of Piscataway receives the appropriate documentation including but not limited to:

- Signed voucher by vendor
- Packing slips
- Invoices

Payment will be rendered upon completion of services or delivery of full order to the satisfaction of the Township, unless otherwise agreed to by written contract or mandated by State Law*. The Township may, at its discretion make partial payments.

*****Contractor, is strongly advised to submit the Invoices on a timely manner to the Project Manager along with the Weekly Certified Payrolls.**

All payments are subject to approval by The Township of Piscataway at a public meeting. Payment may be delayed from time to time depending on The Township of Piscataway meeting schedule.

35. PAYMENT, PARTIAL, WITHHOLDING

A. Contract Thresholds; Partial Payments/Withholding

1. Contracts – Less than \$100,000 – Lump Sum Payment

Public works contracts less than \$100,000 shall be paid in one lump total sum, upon completion of the project and to the satisfaction of the Township

Contracts – Exceeding \$100,000 – Monthly Payments

Public works contracts that exceed \$100,000 shall be paid with partial payments on a monthly basis for work that was completed to the satisfaction of the Township.

3. Withholding of Monies – Percentage to be Withheld

The Township of Piscataway shall withhold the following percentages of outstanding balances of monies owed to contractors:

Balances Exceeding \$500,000 -- Two (2%) Per Cent

Balances Less than \$500,000 -- Five (5%) Per Cent

The amounts withheld shall be returned to the contracts upon fulfillment of the terms of the contract.

B. Prompt Payment

The Township of Piscataway will provide payment in accordance with the “Prompt Payment” law as codified in N.J.S.A. 2A:30A-1 et seq. All payments to contractors are subject to approval by The Township of Piscataway at a public meeting.

The Township of Piscataway generally holds its Agenda, and its Regular Public Meetings twice or more each month. It is at these meetings that The Township of Piscataway reviews payment of bills.

All bills submitted to the Township for approval and payment pursuant to N.J.S.A. 2A:30A-1 et seq. must comply with the following provisions. The “billing date” shall be the date that the contractor signs the certification on the voucher/purchase order that the work has been performed. These bills include all bills for improvements to real property and contracts for engineers, architects, surveyors, design or skilled services relating to construction work.

Bills that are required to be approved by an engineering or architecture firm (prior to submission to the Township for approval) for purposes of confirmation of successful completion of construction work, shall be approved or disapproved within twenty (20) days of submission of same to the architect or engineer. If bills are disapproved or monies withheld from payment, the notice of the reason for same shall be given within the same twenty (20) days to the contract.

The Township must approve payment of all bills. For the Township to consider a bill for approval it must be submitted to the Purchasing Agent at least two weeks prior to a scheduled/or re-scheduled Township meeting date. If the Township, or any agent or officer of the Township, determines that the bill is not approved then notice of the disapproval shall be sent to the contractor with five (5) days of the Township meeting on which the bill was listed for approval. If the bill is approved by the Township, then payment shall be made to the contractor with seven (7) days of the Township meeting as per the “payment cycle.”

Release of Liens

Neither the final payment nor any part of the retained percentage shall become due until the Contractor delivers to The Township of Piscataway a complete Release of all Liens arising out of this Contract and an affidavit that so far as he has knowledge or information, the releases include all labor and material for which a lien could be filed, but the Contractor may, if any subcontractor refuses to furnish a release in full, furnish a bond satisfactory to the Township, to indemnify him against any liens. If any lien remains unsatisfied after all payments are made, the Contractor shall refund to The Township of Piscataway all monies that the latter may be compelled to pay in discharging such a lien, including all costs and reasonable attorney's fees

36. PRE-BID MEETING; ATTENDANCE STRONGLY ENCOURAGED!

The pre-bid meeting is an important part of the bidding process. It permits all bidders to have an equal understanding of the procurement/contracting requirements and of the scope of work involved. Although pre-bid meetings are not mandatory, all potential bidders are strongly encouraged to attend. **Please review the General Specifications for a pre-bid meeting announcement.** Any or all changes to the bid specifications discussed as a result of the pre-bid meeting will be formalized in the form of a written addenda to the specifications and distributed in accordance with N.J.S.A. 40A:11-1 et seq.,

It is anticipated that the pre-bid meeting **SITE/VISIT (JULY 13, 2021 @ 2:00 p.m. . .)** scheduled for this project will have an agenda format such as:

A. Registration Period

At this time all attendees will be asked to register to attend this meeting. Proper photo identification is required. Plans and specifications may be available to download on Township bid website from. Attendance will be recorded.

B. Review of Procurement/Contracting Requirements—Purchasing Agent

The Purchasing Agent will review the major components of the procurement and contracting requirements of the bid.

C. Scope of Work and Scheduled Completion Time— **Guy Gaspari, Director of Public works.**

The Department of Public Works of /CONNOLLY & HICKEY ARCHITECTS in conjunction with the Director of Public Works (Buildings and Grounds) , and the Purchasing Agent will review the scope of the work that is requested and completion time requirements (**As per Specification** Number of Working Days). A review of the plans and any drawings may take place.

D. Walkthrough of Facility/Site-**July 13, 2021 @ 2pm @ Metlar House**

Guy Gaspari, Director of Department of Public Works/CONNOLLY & HICKEY ARCHITECTS, in conjunction with the Assistant Director of Public Works and or the Purchasing Agent, may conduct a facility site walkthrough with all interested parties.

E. Questions; Clarifications—Official Addenda Process(**Due Date for Questions& Answers on the Bid is July 19, 2021 BY 12:00 NOON)**)

Potential bidders are permitted to ask questions during the process. Questions of substantial measure or questions that require clarification of work to be completed may be answered at the meeting, however, **Guy Gaspari , Director of Public Works/CONNOLLY & HICKEY ARCHITECTS** shall answer all such questions in writing in the form of an official addenda. To: purchasing@piscatawaynj.org

Any and all answers to questions, interpretations or any supplemental instructions will be distributed in the form of a written official addenda to the specifications. The official addenda will be provided by the Purchasing Agent's Office of the Township in accordance with N.J.S.A. 40A:11-1 et Seq., to the bidder by E-mail to: purchasing@piscatawaynj.org , no later than seven (7) days, not including Saturdays, Sundays, or holidays prior to the date for acceptance of the bids. All addenda so issued shall become part of the bid and contract document.

37. BIDDERS COMMENT SHEET

This form is for the Bidder's use in offering voluntary alternates, or other comments intended to afford the Township information or opportunities to improve the quality of the project, without invalidating the bid proposal. It may *not* be used to take exception to specific conditions of the project defined in the contract documents which the Bidder does not like. The bid provided must be based upon the plans and specifications, and all contract conditions, as stated. If these documents or conditions contain some untenable item, or extremely expensive provision, for example, to which the Bidder wishes to raise objection, this must be done at the pre-bid meeting, or in writing to the Purchasing office at: Purchasing@piscatawaynj.org through the question process outlined in the Instructions to Bidders. Such inquiries will have response issued by addendum only, and the resulting decision circulated to all bidders of record.

37. PREVAILING WAGES: CONSTRUCTION, ALTERATIONS, REPAIRS

The State of New Jersey Prevailing Wage Act, Chapter 150 Laws of 1963 with applicable statewide wage Department of Labor and Workforce Development in conformance with N.J.S.A. 34:11-56.25 et seq., may be included in these bid contract documents. Copies of these wage rates may be obtained from the State Department of Labor and Workforce Development, and/or viewed at <http://lwd.dol.state.nj.us/> the Prevailing Wages Determination Section.

Compliance with New Jersey Prevailing Wage Act

Every contractor and subcontractor performing services in connection with this project, shall pay all workers a wage rate not less than the published prevailing wage rates, for the locality the work is being performed, as designated by the New Jersey Department of Labor and Workforce Development.

PREVAILING WAGE ACT.

Pursuant to N.J.S.A. 34:11-56.25 et seq., the Contractors on projects for public work shall adhere to all requirements of the New Jersey Prevailing Wage Act. The contractor shall be required to submit a certified payroll record to the Township within ten (10) days of the payment of the wages. In the event it is found that any worker, employed by the Contractor or any subcontractor has been paid a rate of wages less than the prevailing wage required to be paid, the Township may terminate the Contractor's or subcontractor's right to proceed with the work, or such part of the work as to which there has been a failure to pay required wages and the contractor and subcontractor then be required to continue the work to completion or otherwise.

The Contractor is also responsible for obtaining and submitting all subcontractors' certified payroll records within the aforementioned time period. The Contractor shall submit said certified payrolls in the form set forth in N.J.A.C. 12:60- 6.1(c). It is the Contractor's responsibility to obtain any additional copies of the certified payroll form to be submitted by contacting the New Jersey Department of Labor and Workforce Development, Division of Workplace Standards.

Additional information is available at http://lwd.dol.state.nj.us/labor/wagehour/wagerate/pwr_construction.html

Certified Payrolls

Every contractor agrees to submit to The Township of Piscataway a certified payroll for each payroll period within ten (10) days of the payment of wages. The contractor further agrees that no payments will be made to the Contractor by the Township, if certified payrolls are not received by the Township. It is the Contractor's responsibility to insure timely receipt by the Township of certified payrolls.

Submission of Affidavit

Before final payment, the contractor shall furnish The Township of Piscataway with an affidavit stating that all workers have been paid the prevailing rate of wages in accordance with State of New Jersey requirements. The contractor shall keep an accurate record showing the name, craft, or trade and actual hourly rate of wages paid to each workman employed by him in connection with this work. Upon request, the Contractor(s) and each Subcontractor shall file written statements certifying to the amounts then due and owing to any and all workmen for wages due on account of the work. The statements shall be verified by the oaths of the Contractor or Subcontractor, as the case may be.

Posting of Prevailing Wages

The contractor and subcontractor shall post the prevailing wage rates for each craft and classification involved in the work, including the effective date of any changes thereof, in prominent and easily accessible places at the Site of the work and in such place or places as used to pay workmen their wages. N.J.S.A. 34:11-56.32.

PREVAILING WAGE ACT.

Pursuant to N.J.S.A. 34:11-56.25 et seq., The Contractors on projects for public work shall adhere to all requirements of the New Jersey Prevailing Wage Act. The contractor shall be required to submit a certified payroll record to the Township within ten (10) days of the payment of the wages. In the event it is found that any worker, employed by the Contractor or any subcontractor has been paid a rate of wages less than the prevailing wage required to be paid, the Township may terminate the Contractor's or subcontractor's right to proceed with the work, or such part of the work as to which there has been a failure to pay required wages and the contractor and subcontractor then be required to continue the work to completion or otherwise.

The Contractor is also responsible for obtaining and submitting all subcontractors' certified payroll records within the aforementioned time period. The Contractor shall submit said certified payrolls in the form set forth in N.J.A.C. 12:60- 6.1(c). It is the Contractor's responsibility to obtain any additional copies of the certified payroll form to be submitted by contacting the New Jersey Department of Labor and Workforce Development, Division of Workplace Standards.

Additional information is available at http://lwd.dol.state.nj.us/labor/wagehour/wagerate/pwr_construction.html

Prevailing Wages Certification—Submission with Bid

The bidder shall submit a Prevailing Wages Certification with its bid package.

Non-compliance Statement

If it is found that any worker, employed by the contractor or any subcontractor covered by said contract, has been paid a rate of wages less than the prevailing wage required to be paid by such contract, the Township, may begin proceedings to terminate the contractor's or subcontractor's right to proceed with the work, or such part of the work as to which there has been a failure to pay required wages and to prosecute the work to completion or otherwise. The contractor and his sureties shall be liable for any excess costs occasioned thereby to the public body.

38. QUALIFICATION OF BIDDERS - Contractor Questionnaire Certification Form

The Township of Piscataway may make such investigations as it seems necessary to determine the ability of the bidder to perform the terms of the contract. The bidder shall complete a Contractor Questionnaire Certification Form and return same with the bid and shall furnish all information to the Township as the Township may require to determine the contractor's ability to perform the duties and obligations as outlined in these specifications.

All bidders are reminded that bids may be rejected as not being responsive pursuant to N.J.S.A. 40:11-1 et seq., and therefore bidders are asked to complete the Questionnaire and to provide any supporting documentation with the bid package.

39. RESIDENT CITIZENS; PREFERRED IN EMPLOYMENT ON PUBLIC WORKS CONTRACTS

All bidders are to familiarize themselves with N.J.S.A. 34:9-2, which requires the contractor of any public work project to give preference in employment on the project, to citizens of the state of New Jersey. If the terms and conditions of N.J.S.A. 34:9-2 are not complied with, the contract shall be voidable. The Township is obligated to file with the Commissioner of Labor, the names and addresses of all contractors holding contracts with this project.

40. RENEWAL OF CONTRACT; AVAILABILITY AND APPROPRIATION OF FUNDS

The Township of Piscataway may, at its discretion, request that a contract that is subject to renewal, be renewed in full accordance with N.J.S.A. 40:11-1 et seq., The Purchasing Agent may negotiate terms for a renewal of contract proposal and present such negotiated proposal to the Township. The Township of Piscataway is the final authority in awarding renewals of contracts. All multi-year contracts and renewals are subject to the availability and appropriation annually of sufficient funds as may be needed to meet the extended obligation.

41. RIGHT TO KNOW LAW

All potentially hazardous materials or substances must be properly labeled in full accordance with the New Jersey Right to Know Law - N.J.S.A. 34:5A-1 et seq. All contractors or vendors who need additional information about the New Jersey Right to Know Law are to contact the:

New Jersey Department of Health and Senior Services
Right to Know Program
CN 368
Trenton, New Jersey 08625-0368
www.nj.gov/health/workplacehealthandsafety/right-to-know/

NEW JERSEY WORKER AND COMMUNITY RIGHT TO KNOW ACT

The manufacturer or supplier of chemical substances or mixtures shall label them in accordance with the N.J. Worker and Community Right to Know Law (N.J.S.A. 34:5A-1 et seq., and N.J.A.C 8:59-2 et seq.,). All direct use containers shall bear a label indicating the chemical name(s) and Chemical Abstracts Service number(s) of all hazardous substances in the container, and all other substances which are among the five most predominant substances in the container, or their trade secret registry number(s) pursuant to N.J.A.C. 8:59-5. "Container" means a receptacle used to hold a liquid, solid or gaseous substance such as bottles, bags, barrels, cans, cylinders, drums and cartons. (N.J.A.C. 8:59-1.3). Further, all applicable Material Safety Data Sheets (MSDS) - hazardous substance fact sheet - must be furnished. All containers which are stored at owner facilities by subcontractors shall display RTK labeling. Vendors with questions concerning labeling should contact the New Jersey Department of Health and Senior Services Right to Know Program for assistance in developing proper labels.

42. STATEMENT OF OWNERSHIP (N.J.S.A. 52:25-24.2)

Statement of Ownership

No business organization, regardless of form of ownership, shall be awarded any contract for the performance of any work or the furnishing of any goods and services, unless, prior to the receipt of the bid or accompanying the bid of said business organization, bidders shall submit a statement setting forth the names and addresses of all persons and entities that own ten percent or more of its stock or interest of any type at all levels of ownership.

The included Statement of Ownership shall be completed and attached to the bid proposal. This requirement applies to all forms of business organizations, including, but not limited to, corporations and partnerships, publicly-owned corporations, limited partnerships, limited liability corporations, limited liability partnerships, sole proprietorship, and Subchapter S corporations. **Failure to submit a disclosure document shall result in rejection of the bid as it cannot be remedied after bids have been opened.**

Not-for-profit entities should fill in their name, check the not-for-profit box, and certify the form. No other information is required.

43.SUBCONTRACTING: Subcontractor Disclosure Statement

Pursuant to N.J.S.A. 40A:11-1 et seq., any bidder who bids for the overall contract and who will subcontract the following work:

- Plumbing and gas fitting work;
- Refrigeration, heating and ventilating systems and equipment;
- Electrical work, tele-data, fire alarm or security systems; and
- Structural steel and ornamental iron work;

Documents to be Submitted: All Subcontractors

The prime contractor (bidders) who will be using a subcontractor on any part of this bid, shall identify the subcontractor(s) on the appropriate form and submit with the bid package the following subcontractor documents at the time indicated in the box below:

*****IF subcontractor is not applicable please write in N/A on the PAGE.**

| <u>SUBCONTRACTOR DOCUMENT SUBMISSIONS</u> | | |
|--|--|---|
| Estimated Value of Contract – Subcontractor | For Subcontractors in the four major branches listed above: <i><u>Submit with Bid</u></i> | For all other Subcontractors: <i><u>Submit Within ten (10 Days of Receipt of Notice of Award</u></i> |
| \$2,000 through \$5,999 | Contractor’s Registration Certificate | |
| \$6,000 through \$17,499 | Contractor’s Registration Certificate New Jersey Business Registration Certificate | |
| \$17,500 through \$19,999 | Contractor’s Registration Certificate New Jersey Business Registration Certificate | |
| \$20,000 or more | Contractor’s Registration Certificate New Jersey Business Registration Certificate | |

Failure to identify in the Subcontractor’s Disclosure Statement the names and addresses of any or all subcontractors required to be named in the bid, or to submit with the bid the appropriate documents for each such subcontractor, may be cause for the bid to be rejected as being non-responsive.

Contractors are reminded that the subcontractors listed on the forms provided by the township may not be changed later, except in the case of failure in performance or other contract breach where a change is needed to protect the township.

*****IF subcontractor is not applicable please write in N/A on the PAGE.**

44. SUBCONTRACTING: PROHIBITIONS: HOLD HARMLESS

Prime contractors, with whom The Township of Piscataway have an executed contract, may not subcontract any part of any work done for the Township without first receiving written approval from the Township. Contractors seeking to use subcontractors must first complete the Request to Sub Contract Form as provided by the Building Services Department.

Subcontractors Prohibited to Sub Contract

It is the responsibility of the prime contractor to ensure that no subcontractor who has received written permission to do work for the Township, subcontracts any of its/their work without first receiving written approval from the prime contractor **and** the Director of Public Works or his designee.

The prime contractor assumes all responsibility for work performed by subcontractors. The prime contractor must also provide to the Township Purchasing Office the following documents secured from all approved subcontractors:

- Insurance Certificate as outlined in the bid specifications;
- Affirmative Action Evidence as outlined in the bid specifications;
- Written certification that the subcontractor shall adhere to prevailing wages as provided through New Jersey State Law;
- Evidence of Performance Security;
- Documents listed in the Subcontractor Document Submissions list.

In cases of subcontracting, The Township of Piscataway shall only pay the prime contractor. It is the sole responsibility of the prime contractor to ensure that all subcontractors are paid. The Township of Piscataway shall not be responsible for payments to subcontractors and shall be held harmless against any or all claims generated against prime contractors for non-payment to subcontractors.

Penalties – Unauthorized Subcontractors

The Township of Piscataway shall deduct the amount of \$1,000.00 (one thousand dollars) per day as a penalty, for each day a prime contractor uses a subcontractor without first receiving **written** permission from the Building Services Department.

*****IF subcontractor is not applicable please write in N/A on the PAGE.**

45. TAXES; Contractor's Use of Township's Tax Identification Number—Prohibited

As a New Jersey governmental entity, The Township of Piscataway is exempt from the requirements under New Jersey state sales and use tax (N.J.S.A. 54:32B-1 et seq.), and does not pay any sales or use taxes. Bidders should note that they are expected to comply with the provisions of said statute and the rules and regulations promulgated thereto to qualify them for examinations and reference to any and all labor, services, materials and supplies furnished to the Township. Contractors may not use the Township's tax identification number to purchase supplies, materials, service or equipment, for this project.

A contractor may qualify for a New Jersey Sales Tax Exemption on the purchase of materials, supplies and services when these purchases are used exclusively to fulfill the terms and conditions of the contract with the Township. All contractors are referred to New Jersey Division of Taxation—Tax Bulletin S&U-3 and in particular, Contractor's Exempt Purchase Certificate (Form ST-13). Again, contractors are not permitted to use the Township's tax identification number to purchase supplies, materials, services of equipment.

Attached in the bid for the Contractor- ST-13 FORM

(ST-13-FORM)--Once Contract is awarded ST-13 FORM will be attached in the Contract for the Contractor use.

New Jersey State Sales and Use Tax Exemption

Materials and equipment purchases for permanent installation in the project will be exempt from the New Jersey State Sales and Use Tax. Each Bidder shall take this exemption into account in calculating his bid. It shall be the Contractor's responsibility to file the necessary exemption applications.

W-9- Required-Sample in the bid. May/should be submitted with the bid for faster process.

46. TERMINATION OF CONTRACT

If the Township determines that the contractor has failed to comply with the terms and conditions of the bid and/or proposal upon which the issuance of the contract is based or that the contractor has failed to perform said service, duties and or responsibilities in a timely, proper, professional and/or efficient manner, then the Township shall have the authority to terminate the contract upon written notice setting forth the reason for termination and effective date of termination.

Termination by the Township of the contract does not absolve the contractor from potential liability for damages caused the Township by the contractor's breach of this agreement. The Township may withhold payment due the contractor and apply same towards damages once established. The Township will act diligently in accordance with governing statutes to mitigate damages. Damages may include the additional cost of procuring said services or goods from other sources.

The contractor further agrees to indemnify and hold the Township harmless from any liability to subcontractors or suppliers concerning work performed or goods provided arising out of the lawful termination of this agreement.

TERM/COMPLETION OF THE PROJECT: As per specifications/Proposal pages.

47. WITHDRAWAL OF BIDS

Before the Bid Opening

The Purchasing Agent may consider a written request from a bidder to withdraw a bid if the written request is received by the Purchasing Agent before the advertised time of the bid opening. Any bidder who has been granted permission by the Purchasing Agent to have his/her bid withdrawn cannot re-submit a bid for the same advertised bid project. That bidder shall also be disqualified from future bidding on the same project if the project is re-bid.

After the Bid Opening

The Township of Piscataway may consider a written request from a bidder to withdraw a bid, if the written request is received by the Purchasing Agent within five (5) business days after the bid opening. A request to withdraw a bid after the specified number of days will not be honored.

The contractor/vendor who wishes to withdraw a bid must provide a certification supported by written factual evidence that an error or omission was made by the contractor and that the error or omission was a substantial computational error or an unintentional omission or both.

The request to withdraw a bid after the bid opening may be reviewed by the Purchasing Agent, the Director of Public Works, other interested administrators; and the Department of Public Works of Record for the project (if necessary) and/or the Township Attorney and a recommendation will be made to the Township. If the Township of Piscataway grants permission to have the bid withdrawn the contractor/vendor shall be disqualified from bidding on the same project if the project is re-bid. If the contractor/vendor fails to meet the burden of proof to have the bid withdrawn the request to withdraw the bid will be denied and if the contractor/vendor fails to execute the contract the bid guarantee will be forfeited and become property of the Township.

TERM/COMPLETION OF THE PROJECT: As per specifications/Proposal pages.

49. WORK HOURS / INSPECTION

The contractor shall work only during the normal work hours of the Township unless authorized by the Township Engineer/ DPW to do otherwise. Overtime shall be considered those hours before 8:30 A.M and after 4:30 P.M. Monday thru Friday. In addition, Saturday, Sunday and all Township holidays will be considered overtime. The Contractor will be responsible to pay all overtime worked by the Township Inspector or Representative. There shall be an inspector on the job site at all times when the contractor is working.

Supplemental Specifications

2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE

AWARD OF CONTRACT

The Township of Piscataway intends to award the contract for the project as follows:

EXPERIENCE

The Township of Piscataway requires evidence from all bidders that they have completed work or projects of a similar nature as outlined in the bid package. Bidders are to provide evidence of satisfactory completion of work of similar nature as outlined in the bid from other governmental bodies _____ (_____) for at least (5) years. **See attached Plan & Experience forms in the bid. As Per Specifications.**

NUMBER OF WORKING DAYS; TIME OF COMPLETION

The contractor agrees to substantially complete this Public Works Project to the satisfaction of The Township of Piscataway within AS PER SPEC'S (_____) working days from the receipt of the official Notice to Proceed and purchase order. The Township has defined a working day as a calendar day. **As Per Specifications/Proposal pages .**

The number of working days set by the Township may be extended by mutual agreement between the contractor and the Township. The mutual agreement shall be in writing and will be considered an addendum to the contract.

PRE-BID MEETING

A pre-bid meeting for this project is scheduled for (Site Visit Not Mandatory) Strongly Encourage

JULY 13, 2021 @Metlar House

Month / Day / Year

2:00 p.m.

The Township of Piscataway

The purpose of this meeting is to review the legal and technical requirements of the bid proposal. While attendance is not mandatory, prospective bidders are strongly encouraged to attend this important meeting. Addenda to this bid proposal may be issued as a result of the pre-bid meeting.

TRADE CLASSIFICATION(S) (Optional)

A. Bidder:

For the purpose of this Public Works bid, each bidder shall be classified by the State of New Jersey—Division of Property Management and Construction in the following trade(s):

Classification Code
_____ (List Code #)

Classification Trade Name
_____ (List name of trade)

Proof of classification shall be submitted with the bid package in the form of a current Notice of Classification as issued by the New Jersey Division of Property Management and Construction.

B. Subcontractor:

For the purpose of this Public Works bid, each bidder shall use a subcontractor that is properly classified by the State of New Jersey—Division of Property Management and Construction in the following trade(s):

Classification Code
_____ (List Code #)

Classification Trade Name
_____ (List name of trade)

Proof of classification, in the form of a current Notice of Classification form, for each Sub-Contractor, shall be submitted by the bidder with the bid package for any estimated subcontractor work exceeding \$20,000.00.

THE TOWNSHIP OF PISCATAWAY

2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE



BID DOCUMENTS AND REQUIRED DOCUMENTATION

All documents in this section shall be completed, signed and submitted with the bid package – Failure to submit the bid documents and other documents so specified may be cause to reject the bid for being non-responsive



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Purchasing Agent/Township Secretary

ACKNOWLEDGEMENT OF ADDENDUM

2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE

Bid No. 2021-07-22

Bid Date: Thursday, JULY 29, 2021

The bidder acknowledges receipt of the hereinafter enumerated Addenda which have been issued during period of bidding and agrees that said Addenda shall become a part of this contract. The bidder shall list below the numbers and issuing dates of the Addenda.

| <u>ADDENDA NO.</u> | <u>ISSUING DATES</u> |
|--------------------|----------------------|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

No Addenda Received

Name of Company _____

Address _____ P.O. Box _____

City, State, Zip Code _____

Name of Authorized Representative _____

Signature _____ **Date** _____

The Township of Piscataway

CONTRACTOR QUESTIONNAIRE/CERTIFICATION

2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE

Bid No. 2021-07-22

Bid Date: THURSDAY, JULY 29, 2021

Name of Company _____

Street Address _____ P.O. Box _____

City, State, Zip _____

Business Phone Number () _____ Extension _____

Emergency Phone Number () _____

FAX NO. () _____ E-Mail _____

FEIN No. _____

Questionnaire

1. How many years have you been engaged in the contracting business under your present firm or trading name?

_____ Years

2. Have you ever failed to complete any work awarded to your company?

Yes No

If yes, explain _____

3. Have you ever defaulted on a contract?

Yes No

If yes, explain _____

4. Have you or other principals of your company been debarred, suspended, proposed for debarment, declared ineligible, or voluntary excluded from participation in any public works projects by any federal, state, or local agencies, including any "prior negative experience" disqualification pursuant to N.J.S.A. 40A:11-1 et sq.,?

Yes No

If yes, explain _____

(Form continued on next page)

2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE

Bid No. 2021-07-22

Bid Date: THURSDAY, JULY 29, 2021

Name of Company

Experience – Township:

The Township of Piscataway requires evidence from all bidders that they have completed work or projects of a similar nature as outlined in the bid package. Bidders are to provide evidence of satisfactory completion of work of similar nature as outlined in the bid from _____ (___) Townships in New Jersey within the past _____ (5) years. Bidders are to complete the section on experience and provide supporting documentation with the bid package. **As Per Specifications.**

A. Title of Work/Project: _____
Name of Township: _____
Name of School Official: _____ Title _____
Phone Number _____ E-Mail _____
Date(s) of Project: _____

B. Title of Work/Project: _____
Name of Township: _____
Name of School Official: _____ Title _____
Phone Number _____ E-Mail _____
Date(s) of Project: _____

C. Title of Work/Project: _____
Name of Township: _____
Name of School Official: _____ Title _____
Phone Number _____ E-Mail _____
Date(s) of Project: _____

References

Architects--List names of architects that you have worked with on projects within the last five (5) years.

| | <u>Firm</u> | <u>Principal</u> | <u>Phone Number</u> |
|----|-------------|------------------|---------------------|
| 1. | _____ | _____ | _____ |
| 2. | _____ | _____ | _____ |
| 3. | _____ | _____ | _____ |

(Form continued on next page)

"2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE"

Bid No. 2021-07-22

Bid Date: THURSDAY, JULY 29, 2021

Name of Company

Bank--List name of principal bank with which your company does business.

Bank

Officer

Phone Number

Trade--List names of companies within your trade with which your company does business:

Firm

Principal

Phone Number

1. _____
2. _____
3. _____

(Form continued on next page)

Contractor Questionnaire/Certification--page 4

"2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE"

Bid No. 2021-07-22

Bid Date: THURSDAY, JULY 29, 2021

Name of Company

Certifications

• **Debarment**

I certify that the entity listed on the form or any person employed by this entity, are not presently on the following:

- New Jersey Department of Treasury – Consolidated Debarment Report
- NJ Department of Labor and Workforce Development– Prevailing Wage Debarment List
- Federal Debarred Vendor List—System for Award Management (SAM.gov)

• **Direct/Indirect Interests**

I declare and certify that no member of the Township of Piscataway, nor any officer or employee or person whose salary is payable in whole or in part by said the township or their immediate family members are directly or indirectly interested in this bid or in the supplies, materials, equipment, work or services to which it relates, or in any portion of profits thereof. If a situation so exists where a Township member, employee, officer of the Township has an interest in the bid, etc., then please attach a letter of explanation to this document, duly signed by the president of the firm or company.

• **Gifts; Gratuities; Compensation**

I declare and certify that no person from my firm, business, corporation, association or partnership offered or paid any fee, commission or compensation, or offered any gift, gratuity or other thing of value to any school official, Township member or employee of the Township.

• **Vendor Contributions**

I declare and certify that I fully understand N.J.A.C. 6A:23A-6.3 (a) (1-4) concerning vendor contributions to school Township members.

• **False Material Representation/Truth in Contracting**

I further certify that I understand that it is a crime in the second degree in New Jersey to knowingly make a material representation that is false in connection with the negotiation, award or performance of a government contract. I further acknowledge my understanding of the New Jersey Truth in Contracting Laws.

President or Authorized Agent

Signature

CONTRACTOR REGISTRATION CERTIFICATION

Public Works

"2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE"

Bid No. 2021-07-22

Bid Date: THURSDAY, JULY 29, 2021

It is the determination of The Township of Piscataway that this is a Public Works project which contract amount in total will exceed \$2,000.00 (two thousand dollars), therefore, pursuant to the Public Works Contractor Registration Act -- N.J.S.A. 34:11-56.48 et seq., contractors are to be aware of the following:

No contractor shall bid on any contract for public work as defined in section 2 of P.L.1963, c. 150 (C.34:11-56.26) unless the contractor is registered pursuant to this act. No contractor shall list a subcontractor in a bid proposal for the contract unless the subcontractor is registered pursuant to P.L.1999, c.238 (C.34:11-56.48 et seq.) at the time the bid is made. No contractor or subcontractor, including a subcontractor not listed in the bid proposal, shall engage in the performance of any Public Work subject to the contract, unless the contractor or subcontractor is registered pursuant to that act.

I certify that our company understands that the project of The Township of Piscataway requires that all contractors and subcontractors listed in this proposal possess a valid Contractor Registration Certificate at the time the proposal is received by the Township and furthermore certify that I will provide copies of the valid certificates prior to the award of contract.

Name of Company _____

Authorized Agent _____ Title _____

Authorized Signature _____

EQUIPMENT CERTIFICATION

"2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE"

Bid No. 2021-07-22

Bid Date: THURSDAY, JULY 29, 2021

In accordance with 40A:11-1 et seq., I hereby certify that

A) _____ *(Name of Company)* owns all the necessary equipment as required by the specifications and to complete the specified Public Work project.

or

B) _____ *(Name of Company)* leases or controls all the necessary equipment as required by the specifications and to complete the specified Public Work project.

PLEASE NOTE: If your company is not the actual owner of the equipment, **you shall submit with the bid**

1. A certificate stating the source from which the equipment will be obtained and
2. Obtain and submit with the bid a certificate from the owner and person in control of the equipment, definitely granting to the bidder the control of the equipment required during such time it may be necessary for the completion of that portion of the contract for which said equipment will be necessary.

Name of Company _____

Authorized Agent _____ Title _____

Authorized Signature _____

To be completed, signed and returned with Bid

Bid No. 2021-07-22

STATE OF NEW JERSEY -- DIVISION OF PURCHASE AND PROPERTY DISCLOSURE OF INVESTMENT ACTIVITIES IN IRAN

Quote Number:

Bidder/Offeror:

PART 1: CERTIFICATION

BIDDERS MUST COMPLETE PART 1 BY CHECKING EITHER BOX.

FAILURE TO CHECK ONE OF THE BOXES WILL RENDER THE PROPOSAL NON-RESPONSIVE.

Pursuant to Public Law 2012, c. 25, any person or entity that submits a bid or proposal or otherwise proposes to enter into or renew a contract must complete the certification below to attest, under penalty of perjury, that neither the person or entity, nor any of its parents, subsidiaries, or affiliates, is identified on the Department of Treasury's Chapter 25 list as a person or entity engaging in investment activities in Iran. The Chapter 25 list is found on the Division's website at <http://www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf>. Bidders **must** review this list prior to completing the below certification. **Failure to complete the certification will render a bidder's proposal non-responsive.** If the Director finds a person or entity to be in violation of law, s/he shall take action as may be appropriate and provided by law, rule or contract, including but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the party in default and seeking debarment or suspension of the party

PLEASE CHECK THE APPROPRIATE BOX:

I certify, pursuant to Public Law 2012, c. 25, that neither the bidder listed above nor any of the bidder's parents, subsidiaries, or affiliates is listed on the N.J. Department of the Treasury's list of entities determined to be engaged in prohibited activities in Iran pursuant to P.L. 2012, c. 25 ("Chapter 25 List"). I further certify that I am the person listed above, or I am an officer or representative of the entity listed above and am authorized to make this certification on its behalf. **I will skip Part 2 and sign and complete the Certification below.**

OR

I am unable to certify as above because the bidder and/or one or more of its parents, subsidiaries, or affiliates is listed on the Department's Chapter 25 list. I will provide a detailed, accurate and precise description of the activities in Part 2 below and sign and complete the Certification below. Failure to provide such will result in the proposal being rendered as non-responsive and appropriate penalties, fines and/or sanctions will be assessed as provided by law.

PART 2: PLEASE PROVIDE FURTHER INFORMATION RELATED TO INVESTMENT ACTIVITIES IN IRAN

You must provide a detailed, accurate and precise description of the activities of the bidding person/entity, or one of its parents, subsidiaries or affiliates, engaging in the investment activities in Iran outlined above by completing the boxes below.

EACH BOX WILL PROMPT YOU TO PROVIDE INFORMATION RELATIVE TO THE ABOVE QUESTIONS. PLEASE PROVIDE THOROUGH ANSWERS TO EACH QUESTION. IF YOU NEED TO MAKE ADDITIONAL ENTRIES, CLICK THE "ADD AN ADDITIONAL ACTIVITIES ENTRY" BUTTON.

| | | | |
|-----------------------------|----------------------|--------------------------------|----------------------|
| Name | <input type="text"/> | Relationship to Bidder/Offeror | <input type="text"/> |
| Description of Activities | <input type="text"/> | | |
| Duration of Engagement | <input type="text"/> | Anticipated Cessation Date | <input type="text"/> |
| Bidder/Offeror Contact Name | <input type="text"/> | Contact Phone Number | <input type="text"/> |

ADD AN ADDITIONAL ACTIVITIES ENTRY

Certification: I, being duly sworn upon my oath, hereby represent that the foregoing information and any attachments thereto to the best of my knowledge are true and complete. I acknowledge: that I am authorized to execute this certification on behalf of the bidder; that the State of New Jersey is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the completion of any contracts with the State to notify the State in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the State, permitting the State to declare any contract(s) resulting from this certification void and unenforceable.

Full Name (Print):

Signature:

Do Not Enter PIN as a Signature

Title:

Date:

NON-COLLUSION AFFIDAVIT

"2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE"

Re: Bid Proposal for the Township of Piscataway.

Bid No. 2021-7-22

STATE OF _____

Bid Date: THURSDAY, JULY 29, 2021

:ss:

COUNTY OF _____

I, _____ of the City of _____

in the County of _____ and the State of _____

of full age, being duly sworn according to law on my oath depose and say that:

I am _____ (Position in Company)

of the firm of _____ and the bidder making the Proposal for the above names contract, and that I executed the said Proposal with full authority so to do; that I have not, directly or indirectly, entered into any agreement, participated in any collusion, discussed any or all parts of this proposal with any potential bidder, or otherwise taken any action in restraint of free, competitive bidding in connection with the above named bid, and that all statements contained in said Proposal and in this affidavit are true and correct, and made with full knowledge that the Township of Piscataway relies upon the truth of the statements contained in said Proposal and in the statements contained in this affidavit in awarding the contract for the said bid.

I further warrant that no person or selling agency has been employed or retained to solicit or secure such contract upon an agreement or understanding for a commission, percentage, brokerage or contingent fee, except bona fide employees of bona fide established commercial or selling agencies maintained by

(Print Name of Contractor)

(SIGNATURE OF CONTRACTOR)

PREVAILING WAGES CERTIFICATION

“2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE”

Bid No. 2021-07-22

It is the determination of the Township of Piscataway that this is a public works project that in total will exceed \$2,000.00 (two thousand dollars), therefore prevailing wages rules and regulations apply as promulgated by the New Jersey Prevailing Wage Act and in conformance with N.J.S.A. 34:11-56:25 et seq.

Certification

1. I certify that our company understands that this project of the Township of Piscataway requires prevailing wages to be paid in full accordance with the law.
2. I further certify that all subcontractors named in this bid understand that this project requires the subcontractor to pay prevailing wages in full accordance with the law.

Non-compliance Statement

If it is found that any worker, employed by the contractor or any subcontractor covered by said contract, has been paid a rate of wages less than the prevailing wage required to be paid by such contract, The Township , may begin proceedings to terminate the contractor's or subcontractor's right to proceed with the work, or such part of the work as to which there has been a failure to pay required wages and to prosecute the work to completion or otherwise. The contractor and his sureties shall be liable for any excess costs occasioned thereby to the public body.

NOTIFICATION OF VIOLATIONS – New Jersey Department of Labor and Workforce Development

Has the bidder or any person having an “interest” with the bidder, been notified by the New Jersey Department of Labor and Workforce Development by notice issued pursuant to N.J.S.A. 34:11-56:37 that he/she has been in violation for failure to pay prevailing wages as required by the New Jersey Prevailing Wage Act within the last five (5) years?

* Yes _____

No _____

*If yes, please attach a signed document explaining any/or all administrative proceedings with the Department within the last five (5) years. Please include any pending administrative proceedings with the Department if any.

Submission of Certified Payroll Records

All certified payroll records are to be submitted to the person named below who is coordinating the activities for the project:

Guy Gaspari/ Director of Public Works
The Township of Piscataway

Name of Company _____

Authorized Agent _____

Authorized Signature _____

To be completed, signed and returned with Bid/Proposal

Bid No. 2021-07-22

STATEMENT OF OWNERSHIP DISCLOSURE
N.J.S.A. 52:25-24.2 (P.L. 1977, c.33, as amended by P.L. 2016, c.43)

This statement shall be completed, certified to, and included with all bid and proposal submissions. Failure to submit the required information is cause for automatic rejection of the bid or proposal.

Name of Organization: _____

Organization Address: _____

City, State, ZIP: _____

Part I Check the box that represents the type of business organization:

- Sole Proprietorship (skip Parts II and III, execute certification in Part IV)
- Non-Profit Corporation (skip Parts II and III, execute certification in Part IV)
- For-Profit Corporation (any type) Limited Liability Company (LLC)
- Partnership Limited Partnership Limited Liability Partnership (LLP)
- Other (be specific): _____

Part II Check the appropriate box

The list below contains the names and addresses of all stockholders in the corporation who own 10 percent or more of its stock, of any class, or of all individual partners in the partnership who own a 10 percent or greater interest therein, or of all members in the limited liability company who own a 10 percent or greater interest therein, as the case may be. **(COMPLETE THE LIST BELOW IN THIS SECTION)**

OR

No one stockholder in the corporation owns 10 percent or more of its stock, of any class, or no individual partner in the partnership owns a 10 percent or greater interest therein, or no member in the limited liability company owns a 10 percent or greater interest therein, as the case may be. **(SKIP TO PART IV)**

(Please attach additional sheets if more space is needed):

| Name of Individual or Business Entity | Home Address (for Individuals) or Business Address |
|---------------------------------------|--|
| | |
| | |
| | |
| | |

Part III DISCLOSURE OF 10% OR GREATER OWNERSHIP IN THE STOCKHOLDERS, PARTNERS OR LLC MEMBERS LISTED IN PART II

If a bidder has a direct or indirect parent entity which is publicly traded, and any person holds a 10 percent or greater beneficial interest in the publicly traded parent entity as of the last annual federal Security and Exchange Commission (SEC) or foreign equivalent filing, ownership disclosure can be met by providing links to the website(s) containing the last annual filing(s) with the federal Securities and Exchange Commission (or foreign equivalent) that contain the name and address of each person holding a 10% or greater beneficial interest in the publicly traded parent entity, along with the relevant page numbers of the filing(s) that contain the information on each such person. **Attach additional sheets if more space is needed.**

| Website (URL) containing the last annual SEC (or foreign equivalent) filing | Page #'s |
|---|----------|
| | |
| | |
| | |

Please list the names and addresses of each stockholder, partner or member owning a 10 percent or greater interest in any corresponding corporation, partnership and/or limited liability company (LLC) listed in Part II **other than for any publicly traded parent entities referenced above.** The disclosure shall be continued until names and addresses of every non-corporate stockholder, and individual partner, and member exceeding the 10 percent ownership criteria established pursuant to N.J.S.A. 52:25-24.2 has been listed. **Attach additional sheets if more space is needed.**

| Stockholder/Partner/Member and Corresponding Entity Listed in Part II | Home Address (for Individuals) or Business Address |
|---|--|
| | |
| | |
| | |

Part IV Certification

I, being duly sworn upon my oath, hereby represent that the foregoing information and any attachments thereto to the best of my knowledge are true and complete. I acknowledge: that I am authorized to execute this certification on behalf of the bidder/proposer; that **The Township of Piscataway** is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the completion of any contracts with The Township of Piscataway to notify The Township of Piscataway in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with the, permitting The Township of Piscataway to declare any contract(s) resulting from this certification void and unenforceable.

| | | | |
|--------------------|--|--------|--|
| Full Name (Print): | | Title: | |
| Signature: | | Date: | |

This statement shall be completed, certified to, and included with all bid and proposal submissions. Failure to submit the required information is cause for automatic rejection of the bid or proposal.

To be completed, signed and returned with Bid

SUBCONTRACTOR'S DISCLOSURE FORM

"2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE"

Bid No. 2021-07-22

Bid Date: THURSDAY, JULY 29, 2021

The _____ (Name of Bidding Company)

Please Check One! _____ will sub-contract a portion of this project.
 _____ will not sub-contract any portion of this project.

Authorized Agent _____ **Title** _____

Signature of Bidder _____ **Date** _____

If the bidder is not going to subcontract any portion of this project, the bidder need not complete any further part of this document.

If the bidder will subcontract any of the following:

- Plumbing/gas fitting work;
- Refrigeration/heating/ventilating systems & equipment
- Electrical work, tele-data, fire alarm or security systems
- Structural steel/ornamental iron work

the bidder must do the following:

- Identify the contract number and type of work he intends to subcontract;
- Provide the name, address and other pertinent information about the subcontractor;*
- If the cost of the work by the subcontractor shall exceed the amounts listed below, the bidder shall provide in the bid package submission the following documents:

| <u>SUBCONTRACTOR DOCUMENT SUBMISSIONS</u> | | |
|---|---|--|
| <i><u>Estimated Value of Contract – Subcontractor</u></i> | <i>For Subcontractors in the four major branches listed above</i> | <i>For all other Subcontractors</i> |
| | <u>Submit With Bid</u> | <u>Submit Within ten (10 Days of Receipt of Notice of Award</u> |
| \$2,000 through \$5,999 | Contractor's Registration Certificate | |
| \$6,000 through \$17,499 | Contractor's Registration Certificate New Jersey Business Registration Certificate | |
| \$17,500 through \$19,999 | Contractor's Registration Certificate New Jersey Business Registration Certificate | |
| \$20,000 or more | Contractor's Registration Certificate New Jersey Business Registration Certificate | |

Please list subcontractor(s) on the following pages. Bidders may make extra copies of the following pages.

** Failure to identify the names and addresses of any subcontractors required to be named in the bid, or to submit the appropriate documents for each such subcontractor, may be cause for the bid to be rejected as being non-responsive.*

(Form continued on next page)

Subcontractor's Disclosure Statement (Continued)

Return With Bid

"2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE

Bid No. 2021-07-22

Bid Date: THURSDAY JULY 29, 2021

1. Sub-Contractor for PLUMBING AND GAS FITTING WORK

Name of Subcontracting Company _____

Address _____

City, State, Zip _____

Telephone _____ Fax _____

E-Mail _____ FEIN No: _____

Authorized Agent _____ Title _____

Will the cost of sub-contract exceed \$20,000.00?

_____ Yes Estimated Value of Contract \$ _____

_____ No Estimated Value of Contract \$ _____

If checked **yes**, the sub-contractor must be pre-qualified to perform the work. The bidder must provide in the bid package the following:

- The subcontractor's Notice of Classification;
- The subcontractor's Total Amount of Uncompleted Contracts; and
- Other documents that are required:

| <u>SUBCONTRACTOR DOCUMENT SUBMISSIONS</u> | | |
|---|---|--|
| <i><u>Estimated Value of Contract – Subcontractor</u></i> | <i><u>For Subcontractors in the four major branches listed above</u></i> | <i><u>For all other Subcontractors</u></i> |
| | <u>Submit With Bid</u> | <u>Submit Within ten (10 Days of Receipt of Notice of Award</u> |
| \$2,000 through \$5,999 | Contractor's Registration Certificate | |
| \$6,000 through \$17,499 | Contractor's Registration Certificate New Jersey Business Registration Certificate | |
| \$17,500 through \$19,999 | Contractor's Registration Certificate New Jersey Business Registration Certificate | |
| \$20,000 or more | Contractor's Registration Certificate New Jersey Business Registration Certificate | |

Certification of Equipment

The _____ hereby certifies the above named
Name of Bidding Company

subcontractor has the personnel, equipment, experience, financial and sufficient means to complete their portion of the contract in full accordance with the bid specifications.

Authorized Agent (Print) -- Bidder

Signature of Authorized Agent—Bidder

Subcontractor's Disclosure Statement (Continued)

Return With Bid

"2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE"

Bid No. 2021-07-22

Bid Date: THURSDAY, JULY 29, 2021

2. Sub-Contractor for REFRIGERATION, HEATING & VENTILATING SYSTEMS AND EQUIPMENT

Name of Subcontracting Company _____

Address _____

City, State, Zip _____

Telephone _____ Fax _____

E-Mail _____ FEIN No: _____

Authorized Agent _____ Title _____

Will the cost of sub-contract exceed \$20,000.00?

_____ Yes Estimated Value of Contract \$ _____

_____ No Estimated Value of Contract \$ _____

If checked **yes**, the sub-contractor must be pre-qualified to perform the work. The bidder must provide in the bid package the following:

- The subcontractor's Notice of Classification;
- The subcontractor's Total Amount of Uncompleted Contracts; and
- Other documents that are required:

| <u>SUBCONTRACTOR DOCUMENT SUBMISSIONS</u> | | |
|--|---|--|
| <i>Estimated Value of Contract – Subcontractor</i> | <i>For Subcontractors in the four major branches listed above</i> | <i>For all other Subcontractors</i> |
| | <u>Submit With Bid</u> | <u>Submit Within ten (10 Days of Receipt of Notice of Award</u> |
| \$2,000 through \$5,999 | Contractor's Registration Certificate | |
| \$6,000 through \$17,499 | Contractor's Registration Certificate New Jersey Business Registration Certificate | |
| \$17,500 through \$19,999 | Contractor's Registration Certificate New Jersey Business Registration Certificate | |
| \$20,000 or more | Contractor's Registration Certificate New Jersey Business Registration Certificate | |

Certification of Equipment

The _____ hereby certifies the above named
Name of Bidding Company

subcontractor has the personnel, equipment, experience, financial and sufficient means to complete their portion of the contract in full accordance with the bid specifications.

Authorized Agent (Print) -- Bidder

Signature of Authorized Agent—Bidder
(form continued on next page)

Subcontractor's Disclosure Statement (Continued)

Return With Bid

"2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE"

Bid No. 2021-07-22

Bid Date: THURSDAY JULY 29, 2021

3. Sub-Contractor for ELECTRICAL WORK; TELE-DATA, FIRE ALARM OR SECURITY SYSTEMS

Name of Subcontracting Company _____

Address _____

City, State, Zip _____

Telephone _____ Fax _____

E-Mail _____ FEIN No: _____

Authorized Agent _____ Title _____

Will the cost of sub-contract exceed \$20,000.00?

_____ Yes Estimated Value of Contract \$ _____

_____ No Estimated Value of Contract \$ _____

If checked **yes**, the sub-contractor must be pre-qualified to perform the work. The bidder must provide in the bid package the following:

- The subcontractor's Notice of Classification;
- The subcontractor's Total Amount of Uncompleted Contracts; and
- Other documents that are required:

| <u>SUBCONTRACTOR DOCUMENT SUBMISSIONS</u> | | |
|---|---|--|
| <i><u>Estimated Value of Contract – Subcontractor</u></i> | <i><u>For Subcontractors in the four major branches listed above</u></i> | <i><u>For all other Subcontractors</u></i> |
| | <u>Submit With Bid</u> | <u>Submit Within ten (10 Days of Receipt of Notice of Award</u> |
| \$2,000 through \$5,999 | Contractor's Registration Certificate | |
| \$6,000 through \$17,499 | Contractor's Registration Certificate New Jersey Business Registration Certificate | |
| \$17,500 through \$19,999 | Contractor's Registration Certificate New Jersey Business Registration Certificate | |
| \$20,000 or more | Contractor's Registration Certificate New Jersey Business Registration Certificate | |

Certification of Equipment

The _____ hereby certifies the above named
Name of Bidding Company
subcontractor has the personnel, equipment, experience, financial and sufficient means to complete their portion of the contract in full accordance with the bid specifications.

Authorized Agent (Print) -- Bidder

Signature of Authorized Agent—Bidder

(form continued on next page)

"2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE"

Bid No. 2021-07-22

Bid Date: THURSDAY, JULY 29, 2021

4. Sub-Contractor for STRUCTURAL STEEL & IRON WORK

Name of Subcontracting Company _____

Address _____

City, State, Zip _____

Telephone _____ Fax _____

E-Mail _____ FEIN No: _____

Authorized Agent _____ Title _____

Will the cost of sub-contract exceed \$20,000.00?

_____ Yes Estimated Value of Contract \$ _____

_____ No Estimated Value of Contract \$ _____

If checked **yes**, the sub-contractor must be pre-qualified to perform the work. The bidder must provide in the bid package the following:

- The subcontractor's Notice of Classification;
- The subcontractor's Total Amount of Uncompleted Contracts; and
- Other documents that are required:

| <u>SUBCONTRACTOR DOCUMENT SUBMISSIONS</u> | | |
|---|---|--|
| <i><u>Estimated Value of Contract – Subcontractor</u></i> | <i>For Subcontractors in the four major branches listed above</i> | <i>For all other Subcontractors</i> |
| | <u>Submit With Bid</u> | <u>Submit Within ten (10 Days of Receipt of Notice of Award</u> |
| \$2,000 through \$5,999 | Contractor's Registration Certificate | |
| \$6,000 through \$17,499 | Contractor's Registration Certificate New Jersey Business Registration Certificate | |
| \$17,500 through \$19,999 | Contractor's Registration Certificate New Jersey Business Registration Certificate | |
| \$20,000 or more | Contractor's Registration Certificate New Jersey Business Registration Certificate | |

Certification of Equipment

The _____ hereby certifies the above named
Name of Bidding Company

subcontractor has the personnel, equipment, experience, financial and sufficient means to complete their portion of the contract in full accordance with the bid specifications.

Authorized Agent (Print) -- Bidder

Signature of Authorized Agent—Bidder

(form continued on next page)

To be completed, signed and returned with Bid

(IF APPLICABLE)

Subcontractor's Disclosure Statement
Other Trades

"2021-RESTORATION AND EXPANSION AT THE HISTORIC METLAR BODINE HOUSE"

Bid No. 2021-07-22

Bid Date: THURSDAY, JULY 29, 2021

5. Name of Trade/Type of Work _____

Name of Subcontracting Company _____

Address _____

City, State, Zip _____

Telephone _____ Fax _____

E-Mail _____ FEIN No: _____

Authorized Agent _____ Title _____

Will the cost of sub-contract exceed \$20,000.00?

_____ Yes Estimated Value of Contract \$ _____

_____ No Estimated Value of Contract \$ _____

If checked **yes**, the sub-contractor must be pre-qualified to perform the work. The bidder must provide in the bid package the following:

- The subcontractor's Notice of Classification;
- The subcontractor's Total Amount of Uncompleted Contracts; and
- Other documents that are required:

| <u>SUBCONTRACTOR DOCUMENT SUBMISSIONS</u> | | |
|---|---|--|
| <i><u>Estimated Value of Contract – Subcontractor</u></i> | <i>For Subcontractors in the four major branches listed above</i> | <i>For all other Subcontractors</i> |
| | <u>Submit With Bid</u> | <u>Submit Within ten (10 Days of Receipt of Notice of Award</u> |
| \$2,000 through \$5,999 | Contractor's Registration Certificate | |
| \$6,000 through \$17,499 | Contractor's Registration Certificate New Jersey Business Registration Certificate | |
| \$17,500 through \$19,999 | Contractor's Registration Certificate New Jersey Business Registration Certificate | |
| \$20,000 or more | Contractor's Registration Certificate New Jersey Business Registration Certificate | |

Certification of Equipment

The _____ hereby certifies the above named
Name of Bidding Company
 subcontractor has the personnel, equipment, experience, financial and sufficient means to complete their portion of the contract in full accordance with the bid specifications.

Authorized Agent (Print) -- Bidder

Signature of Authorized Agent—Bidder

To be completed, signed and returned with Bid

Bid No. 2021-07-22

Sworn Contractor Certification; Qualifications and Credentials

Pursuant to N.J.S.A. 40A:11-1 et seq., a pre-qualified contractor seeking to bid Township projects, and any subcontractors, that are required to be named under N.J.S.A. 40A:11-1 et seq., shall, as a condition of bidding, submit this Sworn Contractor Certification regarding qualifications and credentials.

I, _____, the principal owner or officer of the company certify that the forging statements are true and our firm has the following qualifications and credentials:

1. A current, valid certificate of registration issued pursuant to "The Public Works Contractor Registration Act," N.J.S.A. 34:11-56:48 et seq. A copy of which is submitted with its bid;
2. A current, valid Certificate of Authority (Business Registration) to perform work in New Jersey issued by the Department of Treasury, a copy of which is submitted with its bid;
3. A current valid contractor trade license required under applicable New Jersey Law for any specialty trade or specialty area in which the firm seeks to perform work, a copy of which is submitted with its bid;
4. During the term of The Township project, I as principal owner or officer of the company or corporation, as contractor, will have in place a suitable quality control and quality assurance program and an appropriate safety and health plan.

Name of Company _____

Print Name of Owner or Officer _____

Signature of Owner or Officer _____

**AMERICANS WITH DISABILITIES ACT OF 1990
Equal Opportunity for Individuals with Disability**

The contractor and The Township of Piscataway (hereafter "owner") do hereby agree that the provisions of Title 11 of the Americans With Disabilities Act of 1990 (the "Act") (42 U.S.C. S121 01 et seq.), which prohibits discrimination on the basis of disability by public entities in all services, programs, and activities provided or made available by public entities, and the rules and regulations promulgated pursuant there unto, are made a part of this contract. In providing any aid, benefit, or service on behalf of the owner pursuant to this contract, the contractor agrees that the performance shall be in strict compliance with the Act. In the event that the contractor, its agents, servants, employees, or subcontractors violate or are alleged to have violated the Act during the performance of this contract, the contractor shall defend the owner in any action or administrative proceeding commenced pursuant to this Act. The contractor shall indemnify, protect, and save harmless the owner, its agents, servants, and employees from and against any and all suits, claims, losses, demands, or damages, of whatever kind or nature arising out of or claimed to arise out of the alleged violation. The contractor shall, at its own expense, appear, defend, and pay any and all charges for legal services and any and all costs and other expenses arising from such action or administrative proceeding or incurred in connection therewith. In any and all complaints brought pursuant to the owner's grievance procedure, the contractor agrees to abide by any decision of the owner which is rendered pursuant to said grievance procedure. If any action or administrative proceeding results in an award of damages against the owner, or if the owner incurs any expense to cure a violation of the ADA which has been brought pursuant to its grievance procedure, the contractor shall satisfy and discharge the same at its own expense.

The owner shall, as soon as practicable after a claim has been made against it, give written notice thereof to the contractor along with full and complete particulars of the claim, If any action or administrative proceeding is brought against the owner or any of its agents, servants, and employees, the *owner shall* expeditiously forward or have forwarded to the contractor every demand, complaint, notice, summons, pleading, or other process received by the owner or its representatives.

It is expressly agreed and understood that any approval by the owner of the services provided by the contractor pursuant to this contract will not relieve the contractor of the obligation to comply with the Act and to defend, indemnify, protect, and save harmless the owner pursuant to this paragraph.

It is further agreed and understood that the owner assumes no obligation to indemnify or save harmless the contractor, its agents, servants, employees and subcontractors for any claim which may arise out of their performance of this Agreement. Furthermore, the contractor expressly understands and agrees that the provisions of this indemnification clause shall in no way limit the contractor's obligations assumed in this Agreement, nor shall they be construed to relieve the contractor from any liability, nor preclude the owner from taking any other actions available to it under any other provisions of the Agreement or otherwise at law.

Name of Company _____

Authorized Agent _____

Title or Position _____

Signature _____

Date _____

EXHIBIT B
MANDATORY EQUAL EMPLOYMENT OPPORTUNITY LANGUAGE
N.J.S.A. 10:5-31 et seq. (P.L.1975, c.127)
N.J.A.C. 17:27-1.1 et seq.
CONSTRUCTION CONTRACTS

During the performance of this contract, the contractor agrees as follows:

The contractor or subcontractor, where applicable, will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Except with respect to affectional or sexual orientation and gender identity or expression, the contractor will ensure that equal employment opportunity is afforded to such applicants in recruitment and employment, and that employees are treated during employment, without regard to their age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Such equal employment opportunity shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

The contractor or subcontractor, where applicable will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.

The contractor or subcontractor will send to each labor union, with which it has a collective bargaining agreement, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under this act and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The contractor or subcontractor, where applicable, agrees to comply with any regulations promulgated by the Treasurer, pursuant to N.J.S.A. 10:5-31 et seq., as amended and supplemented from time to time and the Americans with Disabilities Act.

When hiring or scheduling workers in each construction trade, the contractor or subcontractor agrees to make good faith efforts to employ minority and women workers in each construction trade consistent with the targeted employment goal prescribed by N.J.A.C. 17:27-7.2; provided, however, that the Dept. of LWD, Construction EEO Monitoring Program, may, in its discretion, exempt a contractor or subcontractor from compliance with the good faith procedures prescribed by the following provisions, A, B, and C, as long as the Dept. of LWD, Construction EEO Monitoring Program is satisfied that the contractor or subcontractor is employing workers provided by a union which provides evidence, in accordance with standards prescribed by the Dept. of LWD, Construction EEO Monitoring Program, that its percentage of active "card carrying" members who are minority and women workers is equal to or greater than the targeted employment goal established in accordance with N.J.A.C. 17:27-7.2. The contractor or subcontractor agrees that a good faith effort shall include compliance with the following procedures:

- (A) If the contractor or subcontractor has a referral agreement or arrangement with a union for a construction trade, the contractor or subcontractor shall, within three business days of the contract award, seek assurances from the union that it will cooperate with the contractor or subcontractor as it fulfills its affirmative action obligations under this contract and in accordance with the rules promulgated by the Treasurer pursuant to N.J.S.A. 10:5-31 et. seq., as supplemented and amended from time to time and the Americans with Disabilities Act. If the contractor or subcontractor is unable to obtain said assurances from the construction trade union at least five business days prior to the commencement of construction work, the contractor or subcontractor agrees to afford equal employment opportunities minority and women workers directly, consistent with this chapter. If the contractor's or subcontractor's prior experience with a construction trade union, regardless of whether the union has provided said assurances, indicates a significant possibility that the trade union will not refer sufficient minority and women workers consistent with affording equal employment opportunities as specified in this chapter, the contractor or subcontractor agrees to be prepared to provide such opportunities to minority and women workers directly, consistent with this chapter, by complying with the hiring or scheduling procedures prescribed under (B) below; and the contractor or subcontractor further agrees to take said action immediately if it determines that the union is not referring minority and women workers consistent with the equal employment opportunity goals set forth in this chapter.
- (B) If good faith efforts to meet targeted employment goals have not or cannot be met for each construction trade by adhering to the procedures of (A) above, or if the contractor does not have a referral agreement or arrangement with a union for a construction trade, the contractor or subcontractor agrees to take the following actions:
- (1) To notify the public agency compliance officer, the Dept. of LWD, Construction EEO Monitoring Program, and minority and women referral organizations listed by the Division pursuant to N.J.A.C. 17:27-5.3, of its workforce needs, and request referral of minority and women workers;
 - (2) To notify any minority and women workers who have been listed with it as awaiting available vacancies;
 - (3) Prior to commencement of work, to request that the local construction trade union refer minority and women workers to fill job openings, provided the contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade;

EXHIBIT B (Continued)

- (4) To leave standing requests for additional referral to minority and women workers with the local construction trade union, provided the contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade, the State Training and Employment Service and other approved referral sources in the area;
- (5) If it is necessary to lay off some of the workers in a given trade on the construction site, layoffs shall be conducted in compliance with the equal employment opportunity and nondiscrimination standards set forth in this regulation, as well as with applicable Federal and State court decisions;
- (6) To adhere to the following procedure when minority and women workers apply or are referred to the contractor or subcontractor:
- (i) The contractor or subcontractor shall interview the referred minority or women worker.
 - (ii) If said individuals have never previously received any document or certification signifying a level of qualification lower than that required in order to perform the work of the construction trade, the contractor or subcontractor shall in good faith determine the qualifications of such individuals. The contractor or subcontractor shall hire or schedule those individuals who satisfy appropriate qualification standards in conformity with the equal employment opportunity and non-discrimination principles set forth in this chapter. However, a contractor or subcontractor shall determine that the individual at least possesses the requisite skills, and experience recognized by a union, apprentice program or a referral agency, provided the referral agency is acceptable to the Dept. of LWD, Construction EEO Monitoring Program. If necessary, the contractor or subcontractor shall hire or schedule minority and women workers who qualify as trainees pursuant to these rules. All of the requirements, however, are limited by the provisions of (C) below.
 - (iii) The name of any interested women or minority individual shall be maintained on a waiting list, and shall be considered for employment as described in (i) above, whenever vacancies occur. At the request of the Dept. of LWD, Construction EEO Monitoring Program, the contractor or subcontractor shall provide evidence of its good faith efforts to employ women and minorities from the list to fill vacancies.
 - (iv) If, for any reason, said contractor or subcontractor determines that a minority individual or a woman is not qualified or if the individual qualifies as an advanced trainee or apprentice, the contractor or subcontractor shall inform the individual in writing of the reasons for the determination, maintain a copy of the determination in its files, and send a copy to the public agency compliance officer and to the Dept. of LWD, Construction EEO Monitoring Program.
- (7) To keep a complete and accurate record of all requests made for the referral of workers in any trade covered by the contract, on forms made available by the Dept. of LWD, Construction EEO Monitoring Program and submitted promptly to the Dept. of LWD, Construction EEO Monitoring Program upon request.
- (C) The contractor or subcontractor agrees that nothing contained in (B) above shall preclude the contractor or subcontractor from complying with the union hiring hall or apprenticeship policies in any applicable collective bargaining agreement or union hiring hall arrangement, and, where required by custom or agreement, it shall send journeymen and trainees to the union for referral, or to the apprenticeship program for admission, pursuant to such agreement or arrangement. However, where the practices of a union or apprenticeship program will result in the exclusion of minorities and women or the failure to refer minorities and women consistent with the targeted county employment goal, the contractor or subcontractor shall consider for employment persons referred pursuant to (B) above without regard to such agreement or arrangement; provided further, however, that the contractor or subcontractor shall not be required to employ women and minority advanced trainees and trainees in numbers which result in the employment of advanced trainees and trainees as a percentage of the total workforce for the construction trade, which percentage significantly exceeds the apprentice to journey worker ratio specified in the applicable collective bargaining agreement, or in the absence of a collective bargaining agreement, exceeds the ratio established by practice in the area for said construction trade. Also, the contractor or subcontractor agrees that, in implementing the procedures of (B) above, it shall, where applicable, employ minority and women workers residing within the geographical jurisdiction of the union.

After notification of award, but prior to signing a construction contract, the contractor shall submit to the public agency compliance officer and the Dept. of LWD, Construction EEO Monitoring Program an initial project workforce report (Form AA-201) electronically provided to the public agency by the Dept. of LWD, Construction EEO Monitoring Program, through its website, for distribution to and completion by the contractor, in accordance with N.J.A.C. 17:27-7. The contractor also agrees to submit a copy of the Monthly Project Workforce Report once a month thereafter for the duration of this contract to the Dept. of LWD, Construction EEO Monitoring Program, and to the public agency compliance officer.

The contractor agrees to cooperate with the public agency in the payment of budgeted funds, as is necessary, for on-the-job and/or off-the-job programs for outreach and training of minorities and women.

- (D) The contractor and its subcontractors shall furnish such reports or other documents to the Dept. of LWD, Construction EEO Monitoring Program as may be requested by the Dept. of LWD, Construction EEO Monitoring Program from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be requested by the Dept. of LWD, Construction EEO Monitoring Program for conducting a compliance investigation pursuant to N.J.A.C. 17:27-1.1 et seq.

(Revised: January, 2016)

EXHIBIT B (Continued)

(Revised: January, 2016)

DATED: _____

COMPANY NAME: _____

ADDRESS: _____

TITLE: _____

PRINTED NAME _____

SIGNATURE: _____

BID BOND

BOND NO. _____

KNOW ALL MEN BY THESE PRESENTS, That we, _____
as Principal, and _____, a corporation duly organized under the laws of the State of _____, as Surety, are held and firmly bound unto the Township of Piscataway as Obligee, in the sum of Ten Percent (10%) of the Total Bid, Not to Exceed Twenty Thousand Dollars (\$20,000.00) for the payment of which Principal and Surety Bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally.

WHEREAS, Principal has submitted a bid for _____,
the "Project."

NOW, THEREFORE, if the Obligee shall make any award according to the terms of said bid and the Principal shall enter into a contract with said Obligee in accordance with the terms of said bid and give bond for the faithful performance thereof within the time specified; or if no time is specified within thirty days after the date of said award; or if the Principal shall, in the case of failure so to do, shall pay to the Obligee the difference, not to exceed the amount of this Bond, between the amount specified in bid and such larger amount for which the Obligee may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void: otherwise to remain in full force and effect.

Signed and sealed this ___ day of _____, 20__

Surety: _____

By: _____

Witness: _____

Principal: _____

By: _____

Witness: _____

BIDDER'S AFFIDAVIT

I, _____, being duly sworn, deposes that he/she

resides at _____

and that he/she is the _____ of _____
(Title) (Name of Bidder)

I am duly authorized to sign the bid and that bid is the true offer of the bidder, that the seal attached thereto is the seal of the bidder, and that each, every and all the declarations and statements contained in the bid and any and all affidavits, questionnaires and documents submitted pursuant to the proposal forbids are true to the best of my knowledge and belief.

(Affiant)

HOLD HARMLESS AGREEMENT

“To the fullest extent permitted by law, _____
(Name of Contractor/Vendor/Facility User) agrees to defend, pay on behalf of, indemnify, and hold harmless the Township of Piscataway, its elected and appointed officials, its agents, employees and volunteers and others working on behalf of the Township of Piscataway, against any and all claims, demands, suits, or loss including all costs connected therewith, and for any damages which may be asserted, claimed or recovered against or from the Township of Piscataway, its elected and appointed officials, its agents, employees, volunteers or others working on behalf of the Township of Piscataway, by reason of personal injury, including bodily injury or death and/or property damage, including loss of use thereof, which arises out of or is in any way connected for associated with this contract”

By: _____
Contractor/Vendor/Facility User

Township Of Piscataway

(Authorized Signature)

(Printed Name of Above)

(Address)

(City, State, Zip)

(Phone)

PLAN, EXPERIENCE AND EQUIPMENT QUESTIONNAIRE

Submitted to _____

)A Corporation

By _____)A Copartnership

)An Individual

Principal Office _____

The signatory of this questionnaire guarantees the truth and accuracy of all statements and of all answers to interrogatories hereinafter made.

1) In what manner have you inspected the proposed work? (explain in detail)

2) Explain your plan or layout for performing the proposed work.

3) The work, if awarded to you, will have the personal supervision of whom?

4.1) How many years has your organization been in business under your present name?

4.2) Have you ever failed to complete any work awarded to you? Yes ____ No ____
(If yes, attach additional sheet with details and explanation.)

5) Do you intend to sublet any portion(s) of this work? Yes ____ No ____
If yes, state amount of sub-contract, and if known, the name and address of the sub-contractor, amount and type of his equipment and financial responsibility.

6.) What equipment do you own that is available for and intended to be used on the present project?

| QUANTITY | ITEM | DESCRIPTION, SIZE, CAPACITY, ETC | CONDITION | YEARS OF SERVICE | PRESENT LOCATION |
|----------|------|--|-----------|---------------------|------------------|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

7.) What equipment do you intend to purchase or lease for use on the proposed work, should the contract be awarded to you?

| QUANTITY | ITEM | DESCRIPTION, SIZE, CAPACITY, ETC | APPROXIMATE COST | |
|----------|------|----------------------------------|------------------|-------|
| | | | PURCHASE | LEASE |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

8) Have you made contracts or received firm offers for all materials prices used in preparing your proposal ? Yes ____ No ____ **Do not** give names of dealers or manufacturers.

I CERTIFY THAT THE ABOVE INFORMATION IS CORRECT TO THE BEST OF MY KNOWLEDGE.

DATED: _____

(Signature)

(Name and Title)

(Company Name)

(Address)

(City, State, Zip Code)

Bid No: 2021-07-22

TOWNSHIP OF PISCATAWAY

REQUIRED FORMS:

HOLD HARMLESS AGREEMENT

BIDDER'S AFFIDAVIT

PLAN & EXPERIENCE

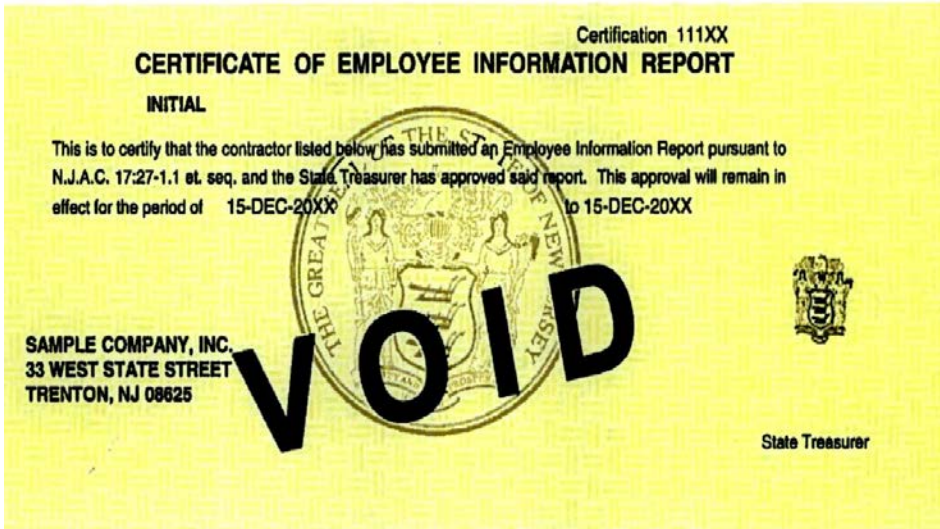
PISCATAWAY BID BOND FORM

CERTIFICATION LAST PAGE

**PLEASE COMPLETE & SIGN ALL OF
THE REQUIRED FORMS IN BLUE INK**

SAMPLE CERTIFICATE OF EMPLOYEE INFORMATION REPORT

TOWNSHIP OF PISCATAWAY



Township of Piscataway

Appendix Section

(Piscataway Township Performance Payment Bond Form only -
Sample in bid)

A. Model Performance Bond Form - *Sample*

B. Surety Disclosure Statement and Certification - *Sample*

C. PISCATAWAY PERFORMANCE BOND FORM- SAMPLE

PISCATAWAY BID BOND FORM ATTACHED.

TO All Bidders:

REMINDER!

Did you sign all of the bid documents?

All bid documents returned to the Township shall be signed with original signatures. Please use [blue ink](#).

The Township will not accept facsimile or rubber stamp signatures.

Failure to sign and submit all bid documents may be cause for disqualification and rejection of the bid.

One “Original” and One PHOTO Copy of the Original marked “True Copy”.

Cover Page, Name, Address, Phone Number, E-mail Address.

Return the entire original bid packet intact by the indicated deadline.

Bidders, Login to website for any addendums.

Website: www.piscatawaynj.org (Click on Home Page , EGov, Bids)

E-mail: purchasing@piscatawaynj.org

732-562-2321 (The Division of Purchasing)

I have read this Bid in its entirety and hereby affirm that the Provider agrees to all terms and acknowledge as outlined in the instructions to bidders.

DATED: _____

(Signature)

(Name and Title)

(Company Name)

(Address)

(City, State, Zip Code)

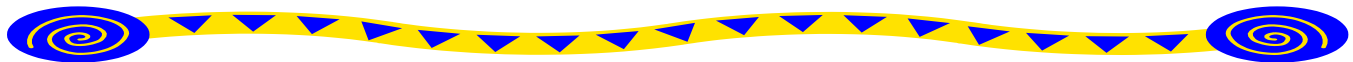
(Corporate Seal)

BID NO. 2021-07-22

THE TOWNSHIP OF PISCATAWAY

2021-RESTORATION & EXPANSION AT THE HISTORIC METLAR
BODINE HOUSE

TECHNICAL SPECIFICATIONS



Pages 1-860

Purchasing Agent/Township Secretary

01 July 2021

PROJECT MANUAL

(Including Technical Specifications)

Restoration and Expansion of HISTORIC METLAR-BODINE HOUSE

Piscataway, Middlesex County
New Jersey 08854

TOWNSHIP of PISCATAWAY
455 Hoes Lane,
Piscataway, New Jersey 08854-4147

Connolly & Hickey Historical Architects, LLC
1 S. Union Avenue
P.O. Box 1726
Cranford, New Jersey 07016
973-746-4911
2024C

| Division | Section Title |
|----------|---------------|
|----------|---------------|

PROCUREMENT AND CONTRACTING DOCUMENTS GROUP

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

000101 PROJECT TITLE PAGE - PROJECT DIRECTORY

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- 013300 SUBMITTAL PROCEDURES
- 013591 HISTORIC TREATMENT PROCEDURES
- 013592 ARCHAEOLOGY
- 014000 QUALITY REQUIREMENTS
- 014200 REFERENCES
- 015000 TEMPORARY FACILITIES AND CONTROLS
- 016000 PRODUCT REQUIREMENTS
- 017300 EXECUTION
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- 017700 CLOSEOUT PROCEDURES
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061063 EXTERIOR ROUGH CARPENTRY
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062023 INTERIOR FINISH CARPENTRY
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Connolly & Hickey Historical Architects, LLC
07/01/2021

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DOCUMENT 000101 - PROJECT TITLE and PROJECT DIRECTORY

1.1 PROJECT INFORMATION

- A. Restoration and Expansion of the Historic Metlar-Bodine House
1. Address: 1281 River Road - Piscataway, New Jersey 08854 / Phone 732-463-8363
 2. Website: www.metlarbodinehousemuseum.org
- B. Owner: Township of Piscataway
1. Owner Contact: Timothy J. Dacey, Township Administrator
 2. Address: 455 Hoes Lane, Piscataway, NJ 08854-4147
 3. Phone: 732-562-2300 / Fax: 732-529-2500
 4. Website: www.piscatawaynj.org
- C. Using Agency: Fellowship for the Metlar-House
1. Using Agency Contact: Junelynn Sadlowski, Executive Director
 2. Address: 1281 River Road - Piscataway, New Jersey 08854
 3. Phone: 732-463-8363
 4. Website: www.metlarbodinehousemuseum.org
- D. Architect: Connolly & Hickey Historical Architects, LLC
1. Principal Architect: Thomas B. Connolly, AIA, Principal Architect (Ext. 107-tom@chhistoricalarchitects.com)
 2. Address: PO Box 1726; 1 South Union Avenue, 3rd Floor, Cranford, New Jersey 07016.
 3. Phone: 973 746 4911
 4. Other Contacts: Margaret M. Hickey, AIA, Historic Preservation Specialist (Ext. 109 – margaret@chhistoricalarchitects.com); Mirek Skros, Assoc. AIA, Architectural Designer (Ext. 108 – mirek@chhistoricalarchitects.com)
 5. Website: www.chhistoricalarchitects.com
 6. Consultants:
 - a. Structural Engineer: KSI Professional Engineers; P.O. Box 628, 149 Yellowbrook Rd. Farmingdale, NJ 07727 / Phone: 732-938-2666
 - b. MEP Engineer: KSI Consulting Engineers; P.O. Box 628, 149 Yellowbrook Rd. Farmingdale, NJ 07727 / Phone: 732-938-2666
 - c. Civil Engineer: Grotto Engineering Associates; 340 North Avenue Cranford, NJ 07016 / Phone: 908.272.8901
 - d. Landscape Architect: John Morgan Thomas Landscape Architect; 4 South Union Street Suite 300, Lambertville, NJ 08530/ Phone 609.397.9070
- E. Architect Project No. 1836C
- F. Issued: 30 June 2021.

1.2 FUNDING SOURCE:

- A. Garden State Historic Preservation Trust Fund

1. Agency: New Jersey Historic Trust
2. Address: PO Box 457, Trenton, New Jersey 08625-0212
3. Phone: 609-984-0473

1.3 OTHER

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END OF DOCUMENT 000101

SECTION 011000

SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Contractor's use of site and premises.
4. Coordination with occupants.
5. Work restrictions.
6. Specification and Drawing conventions.
7. Miscellaneous provisions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
2. Section 017300 "Execution" for coordination of Owner-installed products.

1.3 DEFINITIONS

- A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

1.4 PROJECT INFORMATION

A. Project Identification: 1836C: Restoration and Expansion of Historic Metlar-Bodine House.

1. Project Location: 1281 River Road, Piscataway, NJ 08854

B. Owner: Township of Piscataway.

1. Owner's Representative: Timothy J. Dacey, Business Administrator.
 - a. Township of Piscataway, 455 Hoes Lane, Piscataway, NJ 08854

C. Architect:

1. Architect: Connolly & Hickey Historical Architects, LLC. 973 746 4911.

- D. Architect's Consultants: Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents:

SUMMARY

Restoration and Expansion
Historic Metlar-Bodine House
Piscataway, Middlesex County, NJ
Architects Project No.: 1836C

1. Copy and re-edit subparagraph below for each consultant. Coordinate with requirement in Section 012900 "Payment Procedures" to arrange schedule of values data by design consultant contracts for purposes of delineating the scopes of multiple certifications of payments.
2. Structural Engineer: KSI Professional Engineers; P.O. Box 628, 149 Yellowbrook Rd. Farmingdale, NJ 07727 / Phone: 732-938-2666
3. MEP Engineer: KSI Consulting Engineers; P.O. Box 628, 149 Yellowbrook Rd. Farmingdale, NJ 07727 / Phone: 732-938-2666
4. Civil Engineer: Grotto Engineering Associates; 340 North Avenue Cranford, NJ 07016 / Phone: 908.272.8901
5. Landscape Architect: John Morgan Thomas Landscape Architect; 4 South Union Street Suite 300, Lambertville, NJ 08530/ Phone 609.397.9070

1.5 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
1. THE FOLLOWING DOES NOT LIST ALL WORK REQUIRED FOR A COMPLETE AND PROPER JOB: SELECTIVE DEMOLITION OF EXISTING FINISHES AND STRUCTURAL COMPONENTS; NEW WOOD FRAMED EXPANSION INCLUDING: NEW CONCRETE FOUNDATIONS, NEW FRAMING AND INTERIOR/EXTERIOR FINISHES, NEW DOORS AND WINDOWS, NEW CONCRETE FLOORS, NEW CATERING KITCHEN AND ASSOCIATED PLUMBING, NEW INTERIOR AND EXTERIOR LIGHTING, NEW ASPHALT SHINGLE ROOFING, NEW TPO MEMBRANE ROOFING, NEW GUTTERS, LEADERS, CAST IRON LEADER SLEEVES AND ASSOCIATED UNDERGROUND DRAINAGE, NEW EXTERIOR SITE FEATURES INCLUDING MASONRY RETAINING WALLS, WALKS AND PATIOS, INTERIOR AND EXTERIOR PRIMING AND 2-COAT FINISH PAINTING.
- B. Type of Contract:
1. Project will be constructed under a single prime contract.

1.6 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Unrestricted Use of Site: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. Restricted Use of Site: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- C. Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Limits on Use of Site: Confine construction operations to areas shown on the Drawings.
 2. Driveways, Walkways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.

- b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- D. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- E. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.7 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy Project site and adjacent building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and approval of authorities having jurisdiction.
 - 2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.
- B. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 - 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- C. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
 - 1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
 - 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
 - 3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
 - 4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.8 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work to between 7 a.m. to 5 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.
 - 1. Weekend Hours: Not permitted unless approved in advance by the Owner.
 - 2. Early Morning Hours: Comply with regulations established by the Township for restrictions on noisy work.
 - 3. Work in Existing Building: Same as for addition.
 - 4. Hours for Utility Shutdowns: Provide 72 hours' notice and Owner will adjust schedule accordingly and notify alarm system companies, etc. of system shutdowns.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.
 - 1. Notify Owner not less than two days in advance of proposed disruptive operations.
 - 2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Project site is not permitted.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
 - 3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
 - 4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

SUMMARY

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Architects Project No.: 1836C

- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings and published as part of the U.S. National CAD Standard.
 - 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 013100 "Project Management and Coordination" for requirements for forms for contract modifications provided as part of web-based Project management software.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710 or form prepared by the Architect and/or Owner.

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request or 5 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use forms provided by Architect.

- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.
 - 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - 6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
 - 7. Proposal Request Form: Use form acceptable to Architect.

1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on a form prepared by the Architect.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.7 WORK CHANGE DIRECTIVE

- A. Work Change Directive: Architect may issue a Work Change Directive on EJDC Document C-940. Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.

CONTRACT MODIFICATION PROCEDURES

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1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 2. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect at earliest possible date, but no later than seven (7) days before the date scheduled for submittal of initial Applications for Payment.
 - 3. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Owner's name.
 - c. Owner's Project number.
 - d. Name of Architect.
 - e. Architect's Project number.

- f. Contractor's name and address.
- g. Date of submittal.
2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site.
6. Purchase Contracts: Provide a separate line item in the schedule of values for each Purchase contract. Show line-item value of Purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.
7. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
8. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
9. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
10. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by Architect and paid for by Owner.
- B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

- C. Payment Application Times: Submit Application for Payment to Architect by the 30th of the month. The period covered by each Application for Payment is one month, ending on the last day of the following month.
1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect and coordinated with a Project Meeting and/or site observation.
- D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
1. Other Application for Payment forms proposed by the Contractor may be acceptable to Architect and Owner. Submit forms for approval with initial submittal of schedule of values.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- G. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

- H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from [entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment] [subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application].
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule (preliminary if not final).
 4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
 5. Products list (preliminary if not final).
 6. Sustainable design action plans, including preliminary project materials cost data.
 7. Schedule of unit prices.
 8. Submittal schedule (preliminary if not final).
 9. List of Contractor's staff assignments.
 10. List of Contractor's principal consultants.
 11. Copies of building permits.
 12. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 13. Initial progress report.
 14. Report of preconstruction conference.
 15. Certificates of insurance and insurance policies.
 16. Performance and payment bonds.
 17. Data needed to acquire Owner's insurance.
- J. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 - a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 017700 "Closeout Procedures."
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

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- K. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Certification of completion of final punch list items.
 3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 4. Updated final statement, accounting for final changes to the Contract Sum.
 5. AIA Document G706.
 6. AIA Document G706A.
 7. AIA Document G707.
 8. Evidence that claims have been settled.
 9. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 10. Final liquidated damages settlement statement.
 11. Proof that taxes, fees, and similar obligations are paid.
 12. Waivers and releases.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. RFIs.
 - 4. Digital project management procedures.
 - 5. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
 - 1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site.

Identify individuals and their duties and responsibilities; list addresses, cellular telephone numbers, and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and scheduled activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's construction schedule.
 - 2. Preparation of the schedule of values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Preinstallation conferences.
 - 7. Project closeout activities.
 - 8. Startup and adjustment of systems.

1.6 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 - 1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
 - 2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
 2. Owner name.
 3. Owner's Project number.
 4. Name of Architect.
 5. Architect's Project number.
 6. Date.
 7. Name of Contractor.
 8. RFI number, numbered sequentially.
 9. RFI subject.
 10. Specification Section number and title and related paragraphs, as appropriate.
 11. Drawing number and detail references, as appropriate.
 12. Field dimensions and conditions, as appropriate.
 13. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 14. Contractor's signature.
 15. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: AIA Document G716.
1. Attachments shall be electronic files in PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 5 days of receipt of the RFI response.

- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
 - 1. Project name.
 - 2. Name and address of Contractor.
 - 3. Name and address of Architect.
 - 4. RFI number, including RFIs that were returned without action or withdrawn.
 - 5. RFI description.
 - 6. Date the RFI was submitted.
 - 7. Date Architect's response was received.
 - 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 - 9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1.7 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Architect's Data Files Not Available: Architect will not provide Architect's CAD drawing digital data files for Contractor's use during construction.
- B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
 - 1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 - 2. Name file with submittal number or other unique identifier, including revision identifier.
 - 3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.8 PROJECT MEETINGS

- A. General: The Architect shall schedule and conduct meetings and conferences at Project site unless otherwise indicated.
 - 1. Attendees: The Architect shall inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Architect shall notify Owner and Contractor of scheduled meeting dates and times.
 - 2. Agenda: Architect shall prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. The meeting minutes will be distributed to everyone concerned, including Owner and Contractor, within seven days of the meeting.

- B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Architect shall conduct the conference to review responsibilities and personnel assignments.
 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Items of significance that could affect progress to be discussed, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for RFIs.
 - h. Procedures for testing and inspecting.
 - i. Procedures for processing Applications for Payment.
 - j. Distribution of the Contract Documents.
 - k. Submittal procedures.
 - l. Preparation of record documents.
 - m. Use of the premises.
 - n. Work restrictions.
 - o. Working hours.
 - p. Owner's occupancy requirements.
 - q. Responsibility for temporary facilities and controls.
 - r. Procedures for moisture and mold control.
 - s. Procedures for disruptions and shutdowns.
 - t. Construction waste management and recycling.
 - u. Parking availability.
 - v. Office, work, and storage areas.
 - w. First aid.
 - x. Security.
 - y. Progress cleaning.
 4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Progress Meetings: Architect shall Conduct progress meetings at monthly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner and Architect, Contractor, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

- a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Provide a summary of work conducted since last project meeting.
 - 2) Review schedule for next period. Provide a two week "Look Ahead" outlining work items to be completed in the next two weeks.
- b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Access.
 - 4) Site utilization.
 - 5) Temporary facilities and controls.
 - 6) Progress cleaning.
 - 7) Quality and work standards.
 - 8) Status of correction of deficient items.
 - 9) Field observations.
 - 10) Status of RFIs.
 - 11) Pending changes.
 - 12) Status of Change Orders.
 - 13) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Startup construction schedule.
 - 2. Contractor's Construction Schedule.
 - 3. Construction schedule updating reports.
 - 4. Site Condition Reports.
 - 5. Unusual event reports.
- B. Related Requirements:
 - 1. Section 014000 "Quality Requirements" for schedule of tests and inspections.
 - 2. Section 012900 "Payment Procedures" for schedule of values and requirements for use of cost-loaded schedule for Applications for Payment.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine the critical path of Project and when activities can be performed.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.

- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file.
 - 2. PDF file.
 - 3. Three paper copies, of sufficient size to display entire period or schedule, as required.
- B. Startup construction schedule.
 - 1. Submittal of cost-loaded startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.
- E. Construction Schedule Updating Reports: Submit at each Project Meeting with updates.
- F. Site Condition Reports: Submit at time of discovery of differing conditions.
- G. Unusual Event Reports: Submit at time of unusual event.
- H. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.
- B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related

to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including interim milestones and partial Owner occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review submittal requirements and procedures.
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.

1.6 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 1. Secure time commitments for performing critical elements of the Work from entities involved.
 2. Coordinate each construction activity in the network with other activities, and schedule them in proper sequence.

1.7 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules or adapted for this purpose.
- B. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion and Final Completion.
 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- C. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 2. Temporary Facilities: Indicate start and completion dates for the following as applicable:
 - a. Securing of approvals and permits required for performance of the Work.
 - b. Temporary facilities.
 - c. Construction of mock-ups, prototypes and samples.
 - d. Owner interfaces and furnishing of items.
 - e. Interfaces with Separate Contracts.
 - f. Regulatory agency approvals.
 - g. Punch list.

3. Procurement Activities: Include procurement process activities for the following long lead-time items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 4. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
 5. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 6. Commissioning Time: Include no fewer than 15 days for commissioning.
 7. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
 8. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and Final Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 2. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 3. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use-of-premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 4. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Building flush-out.

- m. Startup and placement into final use and operation.
- n. Commissioning.
- 5. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Temporary enclosure and space conditioning.
 - c. Permanent space enclosure.
 - d. Completion of mechanical installation.
 - e. Completion of electrical installation.
 - f. Substantial Completion.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
- F. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
 - 1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.
- G. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 - 1. Unresolved issues.
 - 2. Unanswered Requests for Information.
 - 3. Rejected or unreturned submittals.
 - 4. Notations on returned submittals.
 - 5. Pending modifications affecting the Work and the Contract Time.
- H. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate Final Completion percentage for each activity.
- I. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.
- J. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1.8 STARTUP CONSTRUCTION SCHEDULE

- A. Schedule: Submit startup, horizontal, construction schedule within seven days of date established for the Notice to Proceed.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

1.9 REPORTS

- A. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- B. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
 - 1. Submit unusual event reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013200

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 1. Preconstruction photographs.
 2. Periodic construction photographs.
 3. Final completion construction photographs.

1.3 INFORMATIONAL SUBMITTALS

- A. Digital Photographs: Submit image files with each Application for Payment and for the work covering the period for which payment is being requested.
 1. Digital Camera: Minimum sensor resolution of 8 megapixels.
 2. Format: Minimum 3200 by 2400 pixels, in unaltered original files, with same aspect ratio as the sensor, uncropped, date and time stamped, in folder named by date of photograph, accompanied by key plan file.
 3. Identification: Provide the following information with each image description in file metadata tag:
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Date photograph was taken.
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

1.4 USAGE RIGHTS

- A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

- A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
- B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - 1. Date and Time: Include date and time in file name for each image.
 - 2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect.
- C. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
 - 1. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
 - 2. Take 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
 - 3. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- D. Periodic Construction Photographs: Take 20 photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
- E. Architect-Directed Construction Photographs: From time to time, Architect will instruct photographer about number and frequency of photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.
- F. Final Completion Construction Photographs: Take 20 color photographs after date of Substantial Completion for submission as project record documents. Architect will inform photographer of desired vantage points.
 - 1. Do not include date stamp.

END OF SECTION 013233

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
 - 1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
 - 2. Section 013233 "Photographic Documentation" for submitting photographs documenting work progress/work installed.
 - 3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.4 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 - 2. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

3. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's final release or approval.
 - g. Scheduled date of fabrication.
 - h. Scheduled dates for purchasing.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings may be provided by Architect for Contractor's use in preparing submittals.
 1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Digital Drawing Software Program: The Contract Drawings are available in AutoCAD Version 2013.
 - c. Contractor shall execute a data licensing agreement in the form of AIA Document C106, Digital Data Licensing Agreement.
 - d. Digital drawing files shall be at the discretion of the Architect and Owner upon written request.
 - e. The following digital data files may be furnished for each appropriate discipline:
 - 1) Floor plans.
 - 2) Exterior and Interior elevations as applicable.
 - 3) Specific drawings as requested by the Contractor in writing.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
- D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 3 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of subcontractor.
 - g. Name of supplier.
 - h. Name of manufacturer.
 - i. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
 - j. Number and title of appropriate Specification Section.
 - k. Drawing number and detail references, as appropriate.
 - l. Location(s) where product is to be installed, as appropriate.
 - m. Other necessary identification.
 4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
 - a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
 5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return without review submittals received from sources other than Contractor.

- a. Transmittal Form for Paper Submittals: Provide locations on form for the following information:
 - 1) Project name.
 - 2) Date.
 - 3) Destination (To:).
 - 4) Source (From:).
 - 5) Name and address of Architect.
 - 6) Name of Construction Manager.
 - 7) Name of Contractor.
 - 8) Name of firm or entity that prepared submittal.
 - 9) Names of subcontractor, manufacturer, and supplier.
 - 10) Category and type of submittal.
 - 11) Submittal purpose and description.
 - 12) Specification Section number and title.
 - 13) Specification paragraph number or drawing designation and generic name for each of multiple items.
 - 14) Drawing number and detail references, as appropriate.
 - 15) Indication of full or partial submittal.
 - 16) Transmittal number, numbered consecutively.
 - 17) Submittal and transmittal distribution record.
 - 18) Remarks.
 - 19) Signature of transmitter.

- E. Options: Identify options requiring selection by Architect.

- F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Action Submittals: Submit four paper copies of each submittal unless otherwise indicated. Architect will return two copies.
 2. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
 3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data in the following format:
 - a. Four paper copies of Product Data unless otherwise indicated. Architect will return two copies.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale (minimum scale . Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions;
 - b. Identification of products;
 - c. Fabrication and installation drawings;
 - d. Roughing-in and setting diagrams;

- e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring;
 - f. Shopwork manufacturing instructions;
 - g. Templates and patterns;
 - h. Schedules;
 - i. Design calculations;
 - j. Compliance with specified standards;
 - k. Notation of coordination requirements; and
 - l. Identification of products.
 - m. Compliance with specified standards.
 - n. Notation of dimensions established by field measurement.
 - o. Relationship and attachment to adjoining construction clearly indicated.
 - p. Seal and signature of professional engineer if specified.
2. Writing Diagrams: Differentiate between manufacturer-installed and field-installed writing.
 3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 11 by 17 inches, but no larger than 30 by 42 inches.
 4. Scale all shop drawings as follows:
 - a. Layouts at 1/4 inch scale; and
 - b. Details at 1 1/2 inch scale.
 6. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
 - b. Four opaque (bond) copies of each submittal. Architect will return two copy(ies).
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit one set of Samples. Architect will return sample, which shall remain on the project site for future reference. Mark up and retain one returned Sample set as a project record sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Mock Ups: Provide infield mock-ups of work showing the physical attributes of the installed product and a representative example of the workmanship.
 1. Where the specifications call for mock-ups of materials, procedures or methods of installation, consult in advance with the Architect to determine the appropriate location of the mock up, or follow the requirements set forth in the Technical Specifications.
 2. All mock-ups shall be undertaken in a workmanlike manner that meets with the design intent of the specifications and drawings. If the design intent is not clear, clarification shall be obtained from the Architect prior to the installation of a mock-up.
 3. At the area of the building approved in advance by the Architect:
 - a. Provide a test mock-up for each material, procedure or method of installation called for in the specification;
 - b. Make the mock-up of an appropriate size to demonstrate the color, texture, compatibility with adjoining surfaces and as required to obtain the Architect's approval; and
 - c. Follow the manufacturer's written instructions and retain those instructions on site upon completion of the mock up.
 4. Revise the mock up as required to obtain the approval of the Architect, unless otherwise stated in the specifications, allow for five (5).
 5. If the mock up is not permitted to be incorporated into the finish Work, remove the rejected mock up completely and re-work all procedures located in all rejected areas.
 6. The mock-up shall be retained until the body of the work for which the mock-up was prepared is complete serving as an example of the level of quality required throughout the work. The mock-up shall be clearly distinguishable and set apart if prepared as part of the existing building fabric. If it is a separate mock-up panel, the panel shall remain on-site and be readily moveable to areas of work for comparison.
 7. Where applicable, the mock-up may be incorporated into the finished Work when approved by the Architect.
- F. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
 5. Submit product schedule in the following format:
 - a. Four paper copies of product schedule or list unless otherwise indicated. Architect will return two copies.
- G. Coordination Drawing Submittals and Contractor's Construction Schedule: Comply with requirements specified in Section 013100 "Project Management and Coordination."
- H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."
- I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in each related technical specification section.
- J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

- R. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- S. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- T. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- U. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- V. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- W. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit three paper copies of certificate, signed and sealed by the responsible

design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
 1. "NO EXCEPTIONS TAKEN": Submission is in compliance with contract documents, or indicated deviations are acceptable;
 2. "SUBMIT SPECIFIED ITEM": The proposed substitution has not been accepted. Resubmission, with the specified item, is required
 3. "REJECTED": Submission does not meet contract requirements and resubmission of submittals, which meet contract requirements, is required
 4. "REVISE AND RESUBMIT": Resubmission is required due to the nature and/or number of corrections.
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Architect without action.

SUBMITTAL PROCEDURES

Restoration and Expansion
Historic Metlar-Bodine House
Piscataway, Middlesex County, NJ
Architects Project No.: 1836C

END OF SECTION 013300

SECTION 013591 - HISTORIC TREATMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general protection and treatment procedures for designated historic spaces, areas, rooms, and surfaces in Project.

1.3 DEFINITIONS

- A. Consolidate: To strengthen loose or deteriorated materials in place.
- B. Design Reference Sample: A sample that represents Architect's prebid selection of work to be matched; it may be existing work or work specially produced for Project.
- C. Dismantle: To disassemble or detach a historic item from a surface, or a nonhistoric item from a historic surface, using gentle methods and equipment to prevent damage to historic items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- D. Historic: Spaces, areas, rooms, surfaces, materials, finishes, and overall appearance that are important to the successful restoration as determined by Architect. Designated historic areas are indicated on Drawings.
- E. Match: To blend with adjacent construction and manifest no apparent difference in material type, species, cut, form, detail, color, grain, texture, or finish; as approved by Architect.
- F. Refinish: To remove existing finishes to base material and apply new finish to match original, or as otherwise indicated.
- G. Reinstall: To protect removed or dismantled item, repair and clean it as indicated for reuse, and reinstall it in original position, or where indicated.
- H. Remove: To take down or detach a nonhistoric item located within a historic space, area, or room, using methods and equipment to prevent damage to historic items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- I. Repair: To correct damage and defects, retaining existing materials, features, and finishes while employing as little new material as possible. This includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials.

- J. Replace: To remove, duplicate, and reinstall entire item with new material. The original item is the pattern for creating duplicates unless otherwise indicated.
- K. Replicate: To reproduce in exact detail, materials, and finish unless otherwise indicated.
- L. Reproduce: To fabricate a new item, accurate in detail to the original, and from either the same or a similar material as the original, unless otherwise indicated.
- M. Restore: To consolidate, replicate, reproduce, repair, and refinish as required to achieve the indicated results.
- N. Retain: To keep existing items that are not to be removed or dismantled.
- O. Reversible: New construction work, treatments, or processes that can be removed or undone in the future without damaging historic materials unless otherwise indicated.
- P. Salvage: To protect removed or dismantled items and deliver them to Owner[**ready for reuse**].
- Q. Stabilize: To provide structural reinforcement of unsafe or deteriorated items while maintaining the essential form as it exists at present; also, to reestablish a weather-resistant enclosure.
- R. Strip: To remove existing finish down to base material unless otherwise indicated.

1.4 COORDINATION

- A. Historic Treatment Subschedule: A construction schedule coordinating the sequencing and scheduling of historic treatment work for entire Project, including each activity to be performed in historic spaces, areas, and rooms, and on historic surfaces; and based on Contractor's Construction Schedule. Secure time commitments for performing critical construction activities from separate entities responsible for historic treatment work.
 - 1. Schedule construction operations in sequence required to obtain best historic treatment results.
 - 2. Coordinate sequence of historic treatment work activities to accommodate the following:
 - a. Owner's continuing occupancy of portions of existing building.
 - b. Owner's partial occupancy of completed Work.
 - c. Other known work in progress.
 - d. Tests and inspections.
 - 3. Detail sequence of historic treatment work, with start and end dates.
 - 4. Utility Services: Indicate how long utility services will be interrupted. Coordinate shutoff, capping, and continuation of utility services.
 - 5. Use of elevator and stairs.
 - 6. Equipment Data: List gross loaded weight, axle-load distribution, and wheel-base dimension data for mobile and heavy equipment proposed for use. Do not use such equipment without certification from Contractor's professional engineer that the structure can support the imposed loadings without damage.
- B. Pedestrian and Vehicular Circulation: Coordinate historic treatment work with circulation patterns within Project building(s) and site.

1.5 PROJECT MEETINGS FOR HISTORIC TREATMENT

- A. Preliminary Historic Treatment Conference: Before starting historic treatment work, Architect will conduct conference at Project site.
1. Attendees: In addition to representatives of Owner, Architect, and Contractor, testing service representative, historic treatment specialists, chemical-cleaner manufacturer(s), and installers whose work interfaces with or affects historic treatment shall be represented at the meeting.
 2. Agenda: Discuss items of significance that could affect progress of historic treatment work, including review of the following:
 - a. Historic Treatment Subschedule: Discuss and finalize; verify availability of materials, historic treatment specialists' personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Fire-prevention plan.
 - c. Governing regulations.
 - d. Areas where existing construction is to remain and the required protection.
 - e. Hauling routes.
 - f. Sequence of historic treatment work operations.
 - g. Storage, protection, and accounting for salvaged and specially fabricated items.
 - h. Existing conditions, staging, and structural loading limitations of areas where materials are stored.
 - i. Qualifications of personnel assigned to historic treatment work and assigned duties.
 - j. Requirements for extent and quality of work, tolerances, and required clearances.
 - k. Methods and procedures related to historic treatments, including product manufacturers' written instructions and precautions regarding historic treatment procedures and their effects on materials, components, and vegetation.
 - l. Embedded work such as flashings and lintels, special details, collection of wastes, protection of occupants and the public, and condition of other construction that affect the Work or will affect the work.
 3. Reporting: Architect will record conference results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from conference.
- B. Coordination Meetings: Conduct specifically for historic treatment work at monthly intervals. Coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: In addition to representatives of Owner, Architect, and Contractor, each historic treatment specialist, supplier, installer, and other entity concerned with progress or involved in planning, coordination, or performance of historic treatment work activities shall be represented at these meetings. All participants at conference shall be familiar with Project and authorized to conclude matters relating to historic treatment work.
 2. Agenda: Review and correct or approve minutes of previous coordination meeting. Review other items of significance that could affect progress of historic treatment work. Include topics for discussion as appropriate to status of Project.
 - a. Historic Treatment Subschedule: Review progress since last coordination meeting. Determine whether each schedule item is on time, ahead of schedule, or behind schedule. Determine how construction behind schedule will be expedited with retention of quality; secure commitments from parties involved to do so. Discuss whether schedule revisions are

required to ensure that current and subsequent activities are completed within the Contract Time.

- b. Schedule Updating: Revise Contractor's Historic Treatment Subschedule after each coordination meeting where revisions to schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
- c. Review present and future needs of each entity present, including review items listed in the "Preliminary Historic Treatment Conference" Paragraph in this article and the following:
 - 1) Interface requirements of historic treatment work with other Project Work.
 - 2) Status of submittals for historic treatment work.
 - 3) Access to historic treatment work.
 - 4) Effectiveness of fire-prevention plan.
 - 5) Quality and work standards of historic treatment work.
 - 6) Change Orders for historic treatment work.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.6 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered or uncovered during the Work, regardless of whether they were previously documented, remain Owner's property.
 1. Dismantle and salvage each item or object and protect it from damage, then promptly deliver it to Owner where directed at Project site.
 2. Coordinate with archaeologist who will establish special procedures for dismantling and salvaging.

1.7 INFORMATIONAL SUBMITTALS

- A. Historic Treatment Subschedule:
 1. Submit historic treatment subschedule within seven days of date established for commencement of historic treatment work.
- B. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by Contractor's historic treatment operations.
- C. Historic Treatment Program: Submit 30 days before work begins.
- D. Fire-Prevention Plan: Submit 30 days before work begins.

1.8 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: An experienced firm regularly engaged in historic treatments similar in nature, materials, design, and extent to the work as specified in each Section

and that has completed a minimum of five recent projects with a record of successful in-service performance that demonstrates the firm's qualifications to perform this work.

1. Field Supervisor Qualifications: Full-time supervisors experienced in historic treatment work similar in nature, material, design, and extent to that indicated for this Project. Supervisors shall be on site when historic treatment work begins and during its progress. Supervisors shall not be changed during Project except for causes beyond control of the specialist firm.
 - a. Construct new mockups of required work whenever a supervisor is replaced.
- B. Title X Requirement: Each firm conducting activities that disturb painted surfaces shall be a "Lead-Safe Certified Firm" according to 40 CFR 745, Subpart E, and use only workers that are trained in lead-safe work practices.
- C. Historic Treatment Program: Prepare a written plan for historic treatment for whole Project, including each phase or process and protection of surrounding materials during operations. Describe in detail the materials, methods, and equipment to be used for each phase of work. Show compliance with indicated methods and procedures specified in this and other Sections. Coordinate this whole-Project historic treatment program with specific requirements of programs required in other historic treatment Sections.
 1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
 2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.
- D. Fire-Prevention Plan: Prepare a written plan for preventing fires during the Work, including placement of fire extinguishers, fire blankets, rag buckets, and other fire-control devices during each phase or process. Coordinate plan with Owner's fire-protection equipment and requirements. Include fire-watch personnel's training, duties, and authority to enforce fire safety.
- E. Safety and Health Standard: ANSI/ASSE A10.6.

1.9 STORAGE AND HANDLING OF HISTORIC MATERIALS

- A. Salvaged Historic Materials:
 1. Clean loose dirt and debris from salvaged historic items unless more extensive cleaning is indicated.
 2. Pack or crate items after cleaning; cushion against damage during handling. Label contents of containers.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner.
 5. Protect items from damage during transport and storage.
- B. Historic Materials for Reinstallation:
 1. Repair and clean historic items for reuse as indicated.
 2. Pack or crate items after cleaning and repairing; cushion against damage during handling. Label contents of containers.

3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment unless otherwise indicated. Provide connections, supports, and miscellaneous materials to make items functional for use indicated.
- C. Existing Historic Materials to Remain: Protect construction indicated to remain against damage and soiling from construction work. Where permitted by Architect, items may be dismantled and taken to a suitable, protected storage location during construction work and reinstalled in their original locations after historic treatment and construction work in the vicinity is complete.
- D. Storage: Catalog and store historic items within a weathertight enclosure where they are protected from moisture, weather, condensation, and freezing temperatures.
1. Identify each item with a nonpermanent mark to document its original location. Indicate original locations on plans, elevations, sections, or photographs by annotating the identifying marks.
 2. Secure stored materials to protect from theft.
 3. Control humidity so that it does not exceed 85 percent. Maintain temperatures 5 deg F or more above the dew point.
- E. Storage Space:
1. Owner will arrange for limited on-site location(s) for free storage of historic material. This storage space includes security and climate control for stored material.
 2. Arrange for off-site locations for storage and protection of historic material that cannot be stored and protected on-site.

1.10 FIELD CONDITIONS

- A. Size Limitations in Historic Spaces: Materials, products, and equipment used for performing the Work and for transporting debris, materials, and products shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building, building site, plants, and surrounding buildings from harm resulting from historic treatment procedures.
1. Use only proven protection methods, appropriate to each area and surface being protected.
 2. Provide temporary barricades, barriers, and directional signage to exclude the public from areas where historic treatment work is being performed.
 3. Erect temporary barriers to form and maintain fire-egress routes.
 4. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during historic treatment work.
 5. Contain dust and debris generated by historic treatment work, and prevent it from reaching the public or adjacent surfaces.

6. Provide shoring, bracing, and supports as necessary. Do not overload structural elements.
 7. Protect floors and other surfaces along hauling routes from damage, wear, and staining.
 8. Provide supplemental sound-control treatment to isolate removal and dismantling work from other areas of the building.
- B. Temporary Protection of Historic Materials:
1. Protect existing historic materials with temporary protections and construction. Do not remove existing materials unless otherwise indicated.
 2. Do not attach temporary protection to historic surfaces except as indicated as part of the historic treatment program and approved by Architect.
- C. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
- D. Utility and Communications Services:
1. Notify Owner, Architect, authorities having jurisdiction, and entities owning or controlling wires, conduits, pipes, and other services affected by historic treatment work before commencing operations.
 2. Disconnect and cap pipes and services as required by authorities having jurisdiction, as required for historic treatment work.
 3. Maintain existing services unless otherwise indicated; keep in service, and protect against damage during operations. Provide temporary services during interruptions to existing utilities.
- E. Existing Drains: Prior to the start of work in an area, test drainage system to ensure that it is functioning properly. Notify Architect immediately of inadequate drainage or blockage. Do not begin work in an area until the drainage system is functioning properly.
1. Prevent solids such as stone or mortar residue or other debris from entering the drainage system. Clean out drains and drain lines that become sluggish or blocked by sand or other materials resulting from historic treatment work.
 2. Protect drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

3.2 PROTECTION FROM FIRE

- A. Follow fire-prevention plan and the following:
1. Comply with NFPA 241 requirements unless otherwise indicated. Perform duties titled "Owner's Responsibility for Fire Protection."
 2. Remove and keep area free of combustibles, including rubbish, paper, waste, and chemicals, unless necessary for the immediate work.
 - a. If combustible material cannot be removed, provide fire blankets to cover such materials.
 3. Prohibit smoking by all persons within Project work and staging areas.
- B. **Heat-Generating Equipment and Combustible Materials:** Comply with the following procedures while performing work with heat-generating equipment or combustible materials, including

welding, torch-cutting, soldering, brazing, removing paint with heat, or other operations where open flames or implements using high heat or combustible solvents and chemicals are anticipated:

1. Use of open-flame equipment is not permitted.
2. As far as practicable, restrict heat-generating equipment to shop areas or outside the building.
3. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that area is safe.
4. Use fireproof baffles to prevent flames, sparks, hot gases, or other high-temperature material from reaching surrounding combustible material.
5. Prevent the spread of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.
6. Fire Watch: Before working with heat-generating equipment or combustible materials, station personnel to serve as a fire watch at each location where such work is performed. Fire-watch personnel shall have the authority to enforce fire safety. Station fire watch according to NFPA 51B, NFPA 241, and as follows:
 - a. Train each fire watch in proper operation of fire-control equipment and alarms.
 - b. Prohibit fire-watch personnel from other work that would distract from fire-watch duties.
 - c. Cease work with heat-generating equipment whenever fire-watch personnel are not present.
 - d. Have fire-watch personnel perform final fire-safety inspection each day beginning no sooner than 30 minutes after conclusion of work in each area to detect hidden or smoldering fires and to ensure that proper fire prevention is maintained.
 - e. Maintain fire-watch personnel at each area of Project site until 60 minutes after conclusion of daily work.

3.3 GENERAL HISTORIC TREATMENT

- A. Have historic treatment work performed only by qualified historic treatment specialists.
- B. Ensure that supervisory personnel are present when historic treatment work begins and during its progress.
- C. Record existing work before each procedure (preconstruction), and record progress during the work. Use digital preconstruction documentation photographs. Comply with requirements in Section 013233 "Photographic Documentation."
- D. Perform regular inspections of Project site as the Work progresses to detect hazards resulting from historic treatment procedures.
- E. Follow the procedures in subparagraphs below and procedures approved in historic treatment program unless otherwise indicated:
 1. Retain as much existing material as possible; repair and consolidate rather than replace.
 2. Use additional material or structure to reinforce, strengthen, prop, tie, and support existing material or structure.
 3. Use reversible processes wherever possible.

4. Use historically accurate repair and replacement materials and techniques unless otherwise indicated.
 5. Record existing work before each procedure (preconstruction) and progress during the work with digital preconstruction documentation photographs. Comply with requirements in Section 013233 "Photographic Documentation."
- F. Notify Architect of visible changes in the integrity of material or components whether from environmental causes including biological attack, UV degradation, freezing, or thawing or from structural defects including cracks, movement, or distortion.
1. Do not proceed with the work in question until directed by Architect.
- G. Where missing features are indicated to be repaired or replaced, provide work with appearance based on accurate duplications rather than on conjecture, subject to approval of Architect.
- H. Where work requires existing features to be removed or dismantled and reinstalled, perform these operations without damage to the material itself, to adjacent materials, or to the substrate.
- I. Identify new and replacement materials and features with permanent marks hidden in the completed Work to distinguish them from original materials. Record a legend of identification marks and the locations of the items on record Drawings.

END OF SECTION 013591

SECTION 013592 - ARCHAEOLOGY

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide such archaeology services by a qualified archaeologist as required during all proposed excavation or ground disturbance related to the installation of utilities for the purposes of documenting all buried cultural and historical artifacts on site prior to their disturbance, wholesale removal or retention as artifacts are to be placed in the possession of the Township of Piscataway/Fellowship for the Metlar House as they deem appropriate. THIS IS AN ARCHAEOLOGICAL MONITORING PROGRAM IN ORDER TO MITIGATE THE IMPACT ON POTENTIAL BURIED CULTURAL REMAINS PRIOR TO THE INSTALLATION OF UTILITIES TO AND FOUNDATIONS FOR THE PROPOSED NEW ADDITION AT THE METLAR-BODINE HOUSE.
- B. The **area of work** includes but may not be limited to the following:
1. Trenches being dug for new utilities.
 2. Footings and foundations for addition.
- C. The **scope of work** includes but may not be limited to the following:
1. Monitoring during trenching for new utilities at the historic site.
 2. Monitoring of previously undisturbed areas as part of any excavations.
 3. All areas of monitoring shall be done in consultation with the archaeologist based on the findings of the following reports:
 - a. Combined Phase I and II Archaeological Investigations Metlar/Bodine House The Ross Hall Wall Addition and Garden Project, Piscataway Township, Middlesex County, New Jersey, prepared by Hunter Research, Inc.
 - b. All previous research is on file at the New Jersey Historic Preservation Office.

1.2 SUBMITTALS

- A. Within 15 days of the Notice to Proceed and/or upon request of the Architect, submit:
1. The preparation and execution of a Data Recovery Plan that addresses the level of excavations needed, as well as the analytical protocols for the data recovery. The Data Recovery Plan shall provide a well-designed sampling strategy. Work may include but is not necessarily limited to:
 - a. Remote sensing to identify resource locations;
 - b. Heavy equipment to remove disturbed soils and to identify and map cultural features; and
 - c. Use of analytical techniques that maximize the data gains from artifact analysis.
 - d. Artifact analysis: recovery and identification (plants, animals, pottery, etc.)
 - e. Explanation of how information is gathered and how the information adds to the historical record of the site's history and development.
- B. As part of the professional services of the Archaeologist to the General Contractor, the following shall be prepared and/or submitted:

1. 80% draft report prepared by the Archaeologist that summarizes the findings of all field and office assessments. The report shall comply with the "Guidelines for Preparing Cultural Resources Management Archaeological Reports Submitted to the (New Jersey) Historic Preservation Office." Recipient(s) of the report shall include 1 copy to the Owner, 1 copy to the New Jersey Historic Preservation Office, 1 copy to the Architect, and as many copies as required by the Contractor for review and comment.
2. Final report prepared by the Archeologist that summarizes the finding of all field and office assessments. The report shall comply with the "Guidelines for Preparing Cultural Resources Management Archaeological Reports Submitted to the (New Jersey) Historic Preservation Office." Recipient(s) of the report shall include 1 copy to the Owner, 1 copy to the New Jersey Historic Preservation Office, 1 copy to the Architect, and as many copies as required by the Contractor for review and comment.
 - a. Three copies of the report submitted shall contain original photographs. The remaining copies may contain quality color and/or black and white copies. The NJHPO shall include a disk of the final report and all attachments.
3. Artifacts recovered during the archaeology survey that have been deemed either by the Archaeologist, or the Owner to be important cultural or historic resources related to the history and development of the Metlar-Bodine Historic Site shall be catalogued according to the standard practices. These artifacts shall be cleaned, catalogued and presented to the Owner in a manner that can be readily stored by Owner within their existing facilities. Preparation of artifacts for storage shall be in accordance with Federal (36 CFR 379) and /or New Jersey facility standards, whichever is more comprehensive.

1.3 PROCEDURES

- A. All previous reports prepared for the project are on file at the New Jersey Historic Preservation Office. (Refer to Section 1.1.C.
- B. In addition to procedures directed by the Contractor for proper performance of the Contractor's responsibilities, the Archaeologist shall provide the following basic services based on the scope of the proposed ground disturbance (refer to Drawings).
 1. Archaeological Monitoring: Pre-construction excavations in areas designated for proposed ground disturbance as part of the Restoration and Expansion of the Historic Metlar-Bodine House .

1.4 ARCHAEOLOGICAL RIGHTS

- A. The site is listed on the New Jersey and National Registers of Historic Places.
- B. All artifact materials of any kind whatsoever are, and shall remain the property of the Owner. The transfer of material culture to the Owner shall be in accordance with Federal and State Standards for artifact cataloguing and storage.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Products: The General Contractor and Archaeologist are responsible for coordinating material requirement responsibilities needed by the Archaeologist to carry out the scope of work.
- B. The Archaeologist is responsible for providing the materials and manpower necessary to carry out the scope of the archaeological investigations in a timely manner so as not to delay undertaking the restoration project within the contract time as established by the Contract.

PART 3 - EXECUTION

3.1 PROCEDURES

- A. The Archaeologist is a direct sub-consultant with the General Contractor. All activities of the Archaeologist shall be coordinated through the General Contractor.
- B. The Architect and Owner shall make periodic site visits during the archaeological investigations. The time and quantity of these observations shall be determined based on the scope of the archaeologists proposed work program.
- C. The Archaeologist shall undertake all field and office investigations based on generally accepted Standards for *Archaeological Monitoring*. Discrepancies noted by either the Owner or the Architect shall be remedied at no additional cost to the Owner.
- D. Field methods and techniques implemented during the investigations may include salvage excavation, hand excavated test units, deep testing, and mechanical removal of the plow-zone and other sediments.
- E. Preparation of a professional findings report shall be the sole responsibility of the Archaeologist. Two submissions shall be required. This report will be reviewed by the New Jersey Historic Preservation Office, the Owner and the Architect.
 - 1. The first shall be at 80% complete and shall include at a minimum the following information:
 - a. Title Page.
 - b. Management Summary.
 - c. Table of Contents.
 - d. Introduction.
 - e. Background Research (research obtained for the preparation of the Historic Preservation Plan may be used by request).
 - f. Research Design.
 - g. Methods.
 - h. Field Results.
 - i. Preliminary Recommendations.
 - j. Sources/References Cited.
 - 2. The second shall be a final submission incorporating the comments of all reviewers where applicable and shall include at a minimum the following information:
 - a. Title Page.
 - b. Management Summary.
 - c. Table of Contents.

- d. Introduction.
 - e. Background Research (research obtained for the preparation of the Historic Preservation Plan may be used by request).
 - f. Research Design.
 - g. Methods.
 - h. Field Results.
 - i. Artifact Analysis.
 - j. Interpretations.
 - k. Recommendations.
 - l. Sources/References Cited.
 - m. Appendices.
3. The final report shall be filed with the New Jersey Historic Preservation Office including a disk containing the report and all required attachments.
- F. The Archaeologist shall catalogue all material artifacts determined important to become part of the cultural resources of the Owner. The materials shall be presented to the Owner in a manner that can be readily stored by the Owner in their existing facilities. The material artifacts shall be delivered to the Owner within 30 days of the submission of the Final Report.

END OF SECTION 013592

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- D. Mockups: Full-size physical assemblies that are constructed either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution;

to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as indicated in-place portions of permanent construction, consisting of multiple products, assemblies, and subassemblies, with cutaways enabling inspection of concealed portions of the Work.
 - a. Include each system, assembly, component, and part of the exterior wall [**and roof**] to be constructed for the Project. Colors of components shall be those selected by the Architect for use in the Project.
 2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
 3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.
- E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
- F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" shall have the same meaning as the term "testing agency."
- I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.4 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.5 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.6 ACTION SUBMITTALS

- A. Mockup Shop Drawings: For integrated exterior mockups.
 1. Include plans, sections, elevations, and details, indicating materials and size of mockup construction.
 2. Indicate manufacturer and model number of individual components.
 3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.7 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
 1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
 2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- F. Reports: Prepare and submit certified written reports and documents as specified.
- G. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.8 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
 - 1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
 - 1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.

- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.9 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, telephone number, and email address of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample-taking and testing and inspection.
 - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 - 12. Name and signature of laboratory inspector.
 - 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
 - 1. Name, address, telephone number, and email address of technical representative making report.
 - 2. Statement on condition of substrates and their acceptability for installation of product.
 - 3. Statement that products at Project site comply with requirements.
 - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 - 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 - 6. Statement of whether conditions, products, and installation will affect warranty.
 - 7. Other required items indicated in individual Specification Sections.

- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement of whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.

1.10 QUALITY ASSURANCE

- A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged in the activities indicated.
1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups of size indicated.
 - 2. Build mockups in location indicated or, if not indicated, as directed by Architect.
 - 3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
 - 5. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 6. Obtain Architect's approval of mockups before starting corresponding Work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 - 7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
 - 8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 10. Demolish and remove mockups when directed unless otherwise indicated.
- K. Integrated Exterior Mockups: Construct integrated exterior mockup as indicated on Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials. Comply with requirements in "Mockups" Paragraph.
 - 1. Coordinate construction of the mockup to allow observation of air barrier installation, flashings, air barrier integration with fenestration systems, and other portions of the building air/moisture barrier and drainage assemblies, prior to installation of veneer, cladding elements, and other components that will obscure the work.

1.11 QUALITY CONTROL

- A. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

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1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 4. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- B. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform duties of Contractor.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.

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6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspection equipment at Project site.
- F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- G. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.
1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
 2. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's and authorities' having jurisdiction reference during normal working hours.
1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.
1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.

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- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

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- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
 - 1. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
 - 2. AIA - American Institute of Architects (The); www.aia.org.
 - 3. AISC - American Institute of Steel Construction; www.aisc.org.
 - 4. AISI - American Iron and Steel Institute; www.steel.org.
 - 5. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
 - 6. ANSI - American National Standards Institute; www.ansi.org.
 - 7. APA - APA - The Engineered Wood Association; www.apawood.org.
 - 8. ASTM - ASTM International; (American Society for Testing and Materials International); www.astm.org.
 - 9. AWI - Architectural Woodwork Institute; www.awinet.org.
 - 10. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
 - 11. AWPA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); www.awpa.com.
 - 12. AWS - American Welding Society; www.aws.org.
 - 13. CDA - Copper Development Association; www.copper.org.
 - 14. CSI - Construction Specifications Institute (The); www.csinet.org.
 - 15. DHI - Door and Hardware Institute; www.dhi.org.
 - 16. FM Approvals - FM Approvals LLC; www.fmglobal.com.
 - 17. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
 - 18. GS - Green Seal; www.greenseal.org.
 - 19. ICBO - International Conference of Building Officials; (See ICC).
 - 20. ICC - International Code Council; www.iccsafe.org.
 - 21. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
 - 22. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
 - 23. MPI - Master Painters Institute; www.paintinfo.com.
 - 24. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.

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25. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
 26. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
 27. NFPA - NFPA; (National Fire Protection Association); www.nfpa.org.
 28. NFPA - NFPA International; (See NFPA).
 29. NFRC - National Fenestration Rating Council; www.nfrc.org.
 30. NHLA - National Hardwood Lumber Association; www.nhla.com.
 31. NLGA - National Lumber Grades Authority; www.nlga.org.
 32. NRCA - National Roofing Contractors Association; www.nrca.net.
 33. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
 34. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
 35. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
 36. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
 37. TMS - The Masonry Society; www.masonrysociety.org.
 38. UBC - Uniform Building Code; (See ICC).
 39. UL - Underwriters Laboratories Inc.; www.ul.com.
 40. USGBC - U.S. Green Building Council; www.usgbc.org.
 41. WDMA - Window & Door Manufacturers Association; www.wdma.com.
 42. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); www.wicnet.org.
 43. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
- C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
1. ICC - International Code Council; www.iccsafe.org.
- D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up-to-date as of the date of the Contract Documents.
1. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
 2. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
 3. EPA - Environmental Protection Agency; www.epa.gov.
 4. OSHA - Occupational Safety & Health Administration; www.osha.gov.
- E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. FED-STD - Federal Standard; (See FS).

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

- A. Installation, removal, and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.
- B. Sewer Service: Owner will pay sewer-service use charges for sewer usage by all entities for construction operations.
- C. Water Service: Owner will pay water-service use charges for water used by all entities for construction operations.
- D. Electric Power Service: Owner will pay electric-power-service use charges for electricity used by all entities for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

- D. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold. Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and requirements for replacing water-damaged Work.
 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
 3. Indicate methods to be used to avoid trapping water in finished work.
- E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
1. Locations of dust-control partitions at each phase of work.
 2. HVAC system isolation schematic drawing.
 3. Location of proposed air-filtration system discharge.
 4. Waste-handling procedures.
 5. Other dust-control measures.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts.

- B. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top and bottom rails. Provide galvanized-steel bases for supporting posts.
- C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less in accordance with ASTM E84 and passing NFPA 701 Test Method 2.
- D. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats, minimum 36 by 60 inches.
- E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

- A. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating, Cooling, and Dehumidifying Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
 - 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 017700 "Closeout Procedures."

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 - 1. Use of Permanent Toilets: Use of Owner's existing or new toilet facilities is not permitted.
- E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
 - 1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
 - 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area, using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 - 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.

3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
- G. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

3.4 SUPPORT FACILITIES INSTALLATION

- A. Comply with the following:
 1. Utilize designated area within existing building for temporary field offices.
 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.
 1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- C. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- D. Storage and Staging: Use designated areas of Project site for storage and staging needs.
- E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 2. Remove snow and ice as required to minimize accumulations.
- F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 3. Maintain and touch up signs, so they are legible at all times.
- G. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."
- H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
 1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 1. Comply with work restrictions specified in Section 011000 "Summary."
- C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings.
 1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant-protection zones.
 2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
 3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
 4. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.
- D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals, so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using materials approved by authorities having jurisdiction.
- G. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.
 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.

2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- I. Temporary Egress: Provide temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction. Provide signage directing occupants to temporary egress.
- J. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and tenants from fumes and noise.
1. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.
 2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 3. Protect air-handling equipment.
 4. Provide walk-off mats at each entrance through temporary partition.
- K. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition in accordance with requirements of authorities having jurisdiction.
 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign, stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

- A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
1. Protect porous materials from water damage.
 2. Protect stored and installed material from flowing or standing water.
 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 4. Remove standing water from decks.
 5. Keep deck openings covered or dammed.

- C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 2. Keep interior spaces reasonably clean and protected from water damage.
 3. Periodically collect and remove waste containing cellulose or other organic matter.
 4. Discard or replace water-damaged material.
 5. Do not install material that is wet.
 6. Discard and replace stored or installed material that begins to grow mold.
 7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed

because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 014200 "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.

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2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
 - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
 1. Store products to allow for inspection and measurement of quantity or counting of units.
 2. Store materials in a manner that will not endanger Project structure.
 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

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6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
 1. Products:

- a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
- b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
- 2. Manufacturers:
 - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Refer to The State of New Jersey General Conditions section 4.7.5 for substitutions.
 - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
- 3. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements 4.7.5 "Substitutions" in the State of New Jersey General Conditions for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
 - 1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 - 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - 3. Evidence that proposed product provides specified warranty.

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4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work, including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of Owner's portion of the Work.
 - 6. Coordination of Owner-installed products.
 - 7. Progress cleaning.
 - 8. Starting and adjusting.
 - 9. Protection of installed construction.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for coordination of Owner-furnished products, Owner-performed work, and limits on use of Project site.
 - 2. Section 013300 "Submittal Procedures" for submitting surveys.
 - 3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.
 - 4. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.
 - 5. Section 078413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.

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- B. Certified Surveys: Submit two copies signed by land surveyor.
- C. Certificates: Submit certificate signed by land surveyor, certifying that location and elevation of improvements comply with requirements.
- D. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
 - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 - 3. Products: List products to be used for patching and firms or entities that will perform patching work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

1.5 CLOSEOUT SUBMITTALS

- A. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.6 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

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4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with requirements specified in other Sections.
1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

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1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
 2. List of detrimental conditions, including substrates.
 3. List of unacceptable installation tolerances.
 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect in accordance with requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks and existing conditions. If discrepancies are discovered, notify Architect promptly.
- B. Engage a land surveyor experienced in laying out the Work, using the following accepted surveying practices:
1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish limits on use of Project site.

3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 4. Inform installers of lines and levels to which they must comply.
 5. Check the location, level and plumb, of every major element as the Work progresses.
 6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

- D. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb, and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations, so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy of type expected for Project.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.
- F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.
- J. Repair or remove and replace damaged, defective, or nonconforming Work.
1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.6 CUTTING AND PATCHING

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of Work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 011000 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 COORDINATION OF OWNER'S PORTION OF THE WORK

- A. Site Access: Provide access to Project site for Owner's construction personnel and Owner's separate contractors.
1. Provide temporary facilities required for Owner-furnished, Contractor-installed and Owner-furnished, Owner-installed products.

2. Refer to Section 011000 "Summary" for other requirements for Owner-furnished, Contractor-installed and Owner-furnished, Owner-installed products
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel and Owner's separate contractors.
1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 2. Preinstallation Conferences: Include Owner's construction personnel and Owner's separate contractors at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

- A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where Work is in progress to the level of cleanliness necessary for proper execution of the Work.
1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

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- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 PROTECTION AND REPAIR OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- D. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION **017419** - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Disposing of nonhazardous demolition and construction waste.

1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.4 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 7 days of date established for the Notice to Proceed.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

1.6 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - 1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."
- B. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - 2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.
- C. Waste Management in Historic Zones or Areas: Hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, by 12 inches or more.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 - 3. Store items in a secure area until installation.
 - 4. Protect items from damage during transport and storage.
 - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Receivers and Processors: List below is provided for information only; available recycling receivers and processors include, but are not limited to, the following:
- C. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
- D. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- E. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - 4. Store components off the ground and protect from the weather.
 - 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

- A. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
 - 1. Pulverize masonry to maximum 4-inch size.
 - 2. Clean and stack undamaged, whole masonry units on wood pallets.
- B. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

3.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 - 2. Polystyrene Packaging: Separate and bag materials.
 - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.

4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
 - a. Comply with requirements in Section 329300 "Plants" for use of clean sawdust as organic mulch.

3.6 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Remove waste materials and dispose of at designated spoil areas on Owner's property.
- D. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
- B. Related Requirements:
 - 1. Section 012900 "Payment Procedures" for requirements for Applications for Payment for Substantial Completion and Final Completion.
 - 2. Section 013233 "Photographic Documentation" for submitting Final Completion construction photographic documentation.
 - 3. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
 - 4. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 5. Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.3 DEFINITIONS

- A. List of Incomplete Items: Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of cleaning agent.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.5 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest-control inspection.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.7 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction, permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Owner's signature for receipt of submittals.
 - 5. Submit testing, adjusting, and balancing records.
 - 6. Submit sustainable design submittals not previously submitted.
 - 7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise Owner of pending insurance changeover requirements.

2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
 6. Advise Owner of changeover in utility services.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements.
 10. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.8 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:
1. Submit a final Application for Payment in accordance with Section 012900 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.
 5. Submit Final Completion photographic documentation.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.9 LIST OF INCOMPLETE ITEMS

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 1. Organize list of spaces in sequential order, starting with exterior areas first, listed by room or space number.
 2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.
 4. Submit list of incomplete items in the following format:
 - a. MS Excel Electronic File: Architect will return annotated file.
 - b. PDF Electronic File: Architect will return annotated file.
 - c. Four Paper Copies: Architect will return two copies.

1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 1. Submit by email to Architect.
- E. Warranties in Paper Form:
 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

F. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
 - i. Vacuum and mop concrete.
 - j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.

- k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - l. Remove labels that are not permanent.
 - m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - q. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
 - r. Clean strainers.
 - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste-disposal requirements in Section 015000 "Temporary Facilities and Controls." and Section 017419 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations required by Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory manuals.
 - 2. Emergency manuals.
 - 3. Systems and equipment operation manuals.
 - 4. Systems and equipment maintenance manuals.
 - 5. Product maintenance manuals.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:
 - 1. Submit on digital media acceptable to Architect by email to Architect. Enable reviewer comments on draft submittals.
 - 2. Submit three paper copies. Architect will return one copy.

- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
 - 1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.
- E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required. (PREFERRED)
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size. All files shall be PDF format.
 - 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes. (WHERE ELECTRONIC NOT FEASIBLE)
 - 1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
 - 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.6 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor has delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.
 8. Piped system diagrams.
 9. Precautions against improper use.
 10. License requirements including inspection and renewal dates.
- C. Descriptions: Include the following:
 1. Product name and model number. Use designations for products indicated on Contract Documents.
 2. Manufacturer's name.
 3. Equipment identification with serial number of each component.
 4. Equipment function.
 5. Operating characteristics.
 6. Limiting conditions.
 7. Performance curves.
 8. Engineering data and tests.

9. Complete nomenclature and number of replacement parts.
- D. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
 2. Equipment or system break-in procedures.
 3. Routine and normal operating instructions.
 4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.7 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
1. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.

3. Identification and nomenclature of parts and components.
 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
 2. Troubleshooting guide.
 3. Precautions against improper maintenance.
 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 5. Aligning, adjusting, and checking instructions.
 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.
- I. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
1. Do not use original project record documents as part of maintenance manuals.

1.8 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of

Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

- D. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.

- E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.

- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.
- B. Related Requirements:
 - 1. Section 017300 "Execution" for final property survey.
 - 2. Section 017700 "Closeout Procedures" for general closeout procedures.
 - 3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit two set(s) of marked-up record prints.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and Contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.
- E. Reports: Submit written report indicating items incorporated into Project Record Documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.4 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding photographic documentation.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Work Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.

4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

1.5 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
 5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.
- B. Format: Submit record specifications as annotated PDF electronic file.

1.6 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.
- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.
- C. Format: Submit Record Product Data as annotated PDF electronic file.
 1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.7 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PROJECT RECORD DOCUMENTS

Restoration and Expansion
Historic Metlar-Bodine House
Piscataway, Middlesex County, NJ
Architects Project No.: 1836C

- B. Format: Submit miscellaneous record submittals as PDF electronic file.
 - 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.8 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Instruction in operation and maintenance of systems, subsystems, and equipment.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
- B. Qualification Data: For instructor.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 QUALITY ASSURANCE

- A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- B. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

1.6 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Systems and equipment operation manuals.
 - c. Systems and equipment maintenance manuals.
 - d. Product maintenance manuals.
 - e. Project Record Documents.
 - f. Identification systems.
 - g. Warranties and bonds.
 - h. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
 - 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.

- d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning.
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

1.7 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

1.8 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

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1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 2. Owner will furnish an instructor to describe Owner's operational philosophy.
 3. Owner will furnish Contractor with names and positions of participants.
- B. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
1. Schedule training with Owner with at least seven days' advance notice.
- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017900

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Demolition and removal of selected site elements.
 - 3. Salvage of existing items to be reused or recycled.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
 - 2. Section 017300 "Execution" for cutting and patching procedures.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and store.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Engineering Survey: Submit engineering survey of condition of building.
- C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for dust control. Indicate proposed locations and construction of barriers.
- D. Schedule of Selective Demolition Activities: Indicate the following:
 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 3. Coordination for shutoff, capping, and continuation of utility services.
 4. Use of elevator and stairs.
 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- E. Predemolition Photographs: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.
- F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.
- G. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.6 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

1.7 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.8 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

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- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Historic Areas: Demolition and hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.
- F. Storage or sale of removed items or materials on-site is not permitted.
- G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.9 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
- D. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.
- E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
 1. Comply with requirements specified in Section 013233 "Photographic Documentation."
 2. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.
 3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

- A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
 1. Arrange to shut off utilities with utility companies.
 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 3. Disconnect, demolish, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

3.4 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."
- B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.
- C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 5. Maintain fire watch during and for at least 2 hours after flame-cutting operations.
 6. Maintain adequate ventilation when using cutting torches.
 7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 10. Dispose of demolished items and materials promptly.

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- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Work in Historic Areas: Selective demolition may be performed only in areas of Project that are not designated as historic. In historic spaces, areas, and rooms, or on historic surfaces, the terms "demolish" or "remove" shall mean historic "removal" or "dismantling" as specified in Section 024296 "Historic Removal and Dismantling."
- D. Removed and Salvaged Items:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area designated by Owner.
 - 5. Protect items from damage during transport and storage.
- E. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse.
 - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- F. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
- B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- C. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."
- D. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See other Sections of this Project Manual for new roofing requirements.
 - 1. Remove existing roof membrane, flashings, copings, and roof accessories.
 - 2. Remove existing roofing system down to substrate.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.

3.8 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 024296 - HISTORIC REMOVAL AND DISMANTLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes historic treatment procedures in the form of special types of selective demolition work for designated historic spaces, areas, rooms, and surfaces and the following specific work:
 - 1. Removal and dismantling of indicated portions of building or structure and debris hauling.
 - 2. Removal and dismantling of indicated site elements and debris hauling.
 - 3. Salvage of existing items to be reused or recycled.
- B. Related Requirements:
 - 1. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.

1.3 DEFINITIONS

- A. Dismantle: To disassemble or detach a historic item from a surface, or a nonhistoric item from a historic surface, using gentle methods and equipment to prevent damage to historic items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- B. Existing to Remain: Existing items that are not to be removed or dismantled, except to the degree indicated for performing required Work.
- C. Remove: To take down or detach a nonhistoric item located within a historic space, area, or room, using methods and equipment to prevent damage to historic items and surfaces; disposing of items unless indicated to be salvaged or reinstalled.
- D. Retain: To keep existing items that are not to be removed or dismantled.
- E. Salvage: To protect removed or dismantled items and deliver them to Owner ready for reuse.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For historic removal and dismantling specialist.
- B. Preconstruction Documentation: Show preexisting conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by Contractor's removal and dismantling operations.
- C. Removal and Dismantling Historic Treatment Program: Submit 30 days before work begins.

- D. List of Items Indicated to Be Salvaged: Prepare a list of items indicated on Drawings to be salvaged for Owner's use or for reinstallation. Submit 15 days before preconstruction conference.
- E. Inventory of Salvaged Items: After removal or dismantling work is complete, submit a list of items that have been salvaged.
 - 1. Include item description, item condition, number of items if more than one of a type, and tag number. Include photo of item in original location.
 - 2. As work proceeds, include on the inventory items that were indicated to be salvaged and items of historic importance discovered during the work. Document reasons, if any, why an item indicated to be salvaged was not salvaged.

1.5 QUALITY ASSURANCE

- A. Removal and Dismantling Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of removal and dismantling work, including protection of surrounding and substrate materials and Project site.
 - 1. Dust and Noise Control: Include locations of proposed temporary dust- and noise-control partitions and means of egress from occupied areas coordinated with continuing on-site operations and other known work in progress.
 - 2. Debris Hauling: Include plans clearly marked to show debris hauling routes, turning radii, and locations and details of temporary protective barriers.
- B. Mockups: Prepare mockups of specific historic removal and dismantling procedures specified in this Section to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
- C. Regulatory Requirements: Comply with notification regulations of authorities having jurisdiction before beginning removal and dismantling work. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.6 FIELD CONDITIONS

- A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with removal and dismantling work.
- C. Storage or sale of removed or dismantled items on-site is not permitted unless otherwise indicated.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION

3.1 HISTORIC REMOVAL AND DISMANTLING EQUIPMENT

- A. Removal Equipment: Use only hand-held tools, except as follows or unless otherwise approved by Architect on a case-by-case basis:
 - 1. Light jackhammers are allowed subject to Architect's approval.
 - 2. Large air hammers are not permitted.
- B. Dismantling Equipment: Use manual, hand-held tools, except as follows or otherwise approved by Architect on a case-by-case basis:
 - 1. Hand-held power tools and cutting torches are permitted only as submitted in the historic treatment program. They must be adjustable so as to penetrate or cut only the thickness of material being removed.
 - 2. Pry bars more than 18 inches long and hammers weighing more than 2 lb are not permitted for dismantling work.

3.2 EXAMINATION

- A. Preparation for Removal and Dismantling: Examine construction to be removed or dismantled to determine best methods to safely and effectively perform removal and dismantling work. Examine adjacent work to determine what protective measures are necessary. Make explorations, probes, and inquiries as necessary to determine condition of construction to be removed or dismantled and location of utilities and services to remain that may be hidden by construction that is to be removed or dismantled.
 - 1. Verify that affected utilities are disconnected and capped.
 - 2. Inventory and record the condition of items to be removed and dismantled for reinstallation or salvage. Enter this information on the submittal of inventory of salvaged items.
 - 3. Before removal or dismantling of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
 - 4. Engineering Survey: Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures as a result of removal and dismantling work.
- B. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
 - 1. Comply with requirements specified in Section 013233 "Photographic Documentation."
- C. Perform surveys as the Work progresses to detect hazards resulting from historic removal and dismantling procedures.

3.3 HISTORIC REMOVAL AND DISMANTLING

- A. General: Have removal and dismantling work performed by a qualified historic removal and dismantling specialist. Ensure that historic removal and dismantling specialist's field supervisors are present when removal and dismantling work begins and during its progress.
- B. Perform work according to the historic treatment program and approved mockup(s).
 - 1. Perform removal and dismantling to the limits indicated.
 - 2. Provide supports or reinforcement for existing construction that becomes temporarily weakened by removal and dismantling work, until the Project Work is completed unless otherwise indicated.

3. Perform cutting by hand or with small power tools wherever possible. Cut holes and slots neatly to size required, with minimum disturbance of adjacent work.
 4. Do not operate air compressors inside building unless approved by Architect in each case.
 5. Do not drill or cut columns, beams, joints, girders, structural slabs, or other structural supporting elements, without having Contractor's professional engineer's written approval for each location before such work is begun.
 6. Dispose of removed and dismantled items off-site unless indicated to be salvaged or reinstalled.
- C. Water-Mist Sprinkling: Use water-mist sprinkling and other wet methods to control dust only with adequate, approved procedures and equipment according to the historic treatment program to ensure that such water does not create a hazard or adversely affect other building areas or materials.
- D. Unacceptable Equipment: Keep equipment that is not permitted for historic removal or dismantling work away from the vicinity where such work is being performed.
- E. Removing and Dismantling Items on or Near Historic Surfaces:
1. Use only dismantling equipment and procedures within 12 inches of historic surface. Do not use pry bars. Protect historic surface from contact with or damage by tools.
 2. Unfasten items in the opposite order from which they were installed.
 3. Support each item as it becomes loosened to prevent stress and damage to the historic surface.
 4. Dismantle anchorages.
- F. Loose Plaster: Identify loose, nonhistoric plaster, and separate it from its substrate by tapping with a hammer and prying with a chisel or screwdriver. Do not use pry bars. Leave sound, firmly adhered plaster in place. Do not damage, remove, or dismantle historic plasterwork, except where indicated or where it is an immediate hazard to personnel and as approved by Architect.
- G. Concrete Floor Surface Removal: Remove floor surfaces, fill, and topping to the indicated lower elevations or cleavage planes as indicated on Drawings. Use dismantling methods when removing floor surfaces or less away from historic walls. Take away material to a uniform surface at the indicated level.
- H. Anchorages:
1. Remove anchorages associated with removed items.
 2. Dismantle anchorages associated with dismantled items.
 3. In nonhistoric surfaces, patch holes created by anchorage removal or dismantling according to the requirements for new work.
 4. In historic surfaces, patch or repair holes created by anchorage removal or dismantling according to Section that is specific to the historic surface being patched.

END OF SECTION 024296

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Related Requirements:
 - 1. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete Subcontractor.
 - e. Special concrete finish Subcontractor.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, steel reinforcement installation, methods for achieving specified floor and slab flatness and levelness floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.

- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect.
- E. Samples: For waterstops.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Waterstops.
 - 6. Curing compounds.
 - 7. Floor and slab treatments.
 - 8. Bonding agents.
 - 9. Adhesives.
 - 10. Vapor retarders.
 - 11. Semirigid joint filler.
 - 12. Joint-filler strips.
 - 13. Repair materials.
- C. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
- E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- F. Field quality-control reports.
- G. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: An independent agency (DPMC pre-qualified), qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be qualified in accordance with ACI Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be qualified in accordance with ACI Concrete Laboratory Testing Technician, Grade II.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.
- D. Mockups: Cast concrete slab-on-grade and formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.
 - 1. Build panel approximately 200 sq. ft. for slab-on-grade and 100 sq. ft. for formed surface in the location indicated or, if not indicated, as directed by Architect.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.9 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301.
 2. ACI 117.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Plywood, metal, or other approved panel materials.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- F. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

- C. Galvanized Reinforcing Bars: ASTM A 615/A 615M, Grade 60 ASTM A 706/A 706M, deformed bars, ASTM A 767/A 767M, Class I zinc coated after fabrication and bending.
- D. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60 ASTM A 706/A 706M, deformed bars, ASTM A 775/A 775M, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.
- E. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60, deformed bars, assembled with clips.
- F. Plain-Steel Wire: ASTM A 1064/A 1064M, galvanized.
- G. Deformed-Steel Wire: ASTM A 1064/A 1064M.
- H. Epoxy-Coated Wire: ASTM A 884/A 884M, Class A, Type 1 coated, deformed-steel wire, with less than 2 percent damaged coating in each 12-inch wire length.
- I. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- J. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.
- K. Galvanized-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from galvanized-steel wire into flat sheets.
- L. Epoxy-Coated Welded-Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, deformed steel.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Epoxy-Coated Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, ASTM A 775/A 775M epoxy coated.
- C. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 775M.
- D. Zinc Repair Material: ASTM A 780/A 780M.
- E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.5 CONCRETE MATERIALS

- A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- B. Cementitious Materials:
 1. Portland Cement: ASTM C 150/C 150M, Type I, gray or white as needed to achieve appropriate color.
 2. Fly Ash: ASTM C 618, Class F or C.
 3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.
 4. Blended Hydraulic Cement: ASTM C 595/C 595M, Type IS, portland blast-furnace slag cement.
 5. Silica Fume: ASTM C 1240, amorphous silica.
- C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Lightweight Aggregate: ASTM C 330/C 330M, 1-inch nominal maximum aggregate size.
- E. Air-Entraining Admixture: ASTM C 260/C 260M.
- F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
- G. Color Pigment: ASTM C 979/C 979M, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
 1. Color: Match Architect's sample.
- H. Water: ASTM C 94/C 94M and potable.

2.6 FIBER REINFORCEMENT

- A. Carbon-Steel Fiber: ASTM A 820/A 820M, Type 1, cold-drawn wire, deformed, minimum of 1.5 inches long, and aspect ratio of 35 to 40.

2.7 WATERSTOPS

- A. Flexible Rubber Waterstops: CE CRD-C 513, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
 - 1. Profile: Flat dumbbell with center bulb.
 - 2. Dimensions: 4 inches by 3/16 inch thick; nontapered.

2.8 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A, except with maximum water-vapor permeance of. Include manufacturer's recommended adhesive or pressure-sensitive tape.
- B. Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

2.9 FLOOR AND SLAB TREATMENTS

- A. Slip-Resistive Emery Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive, crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials with 100 percent passing 3/8-inch sieve.
- B. Emery Dry-Shake Floor Hardener: Pigmented, factory-packaged, dry combination of portland cement, graded emery aggregate, and plasticizing admixture; with emery aggregate consisting of no less than 60 percent of total aggregate content.
 - 1. Color: Match Architect's sample.
- C. Pigmented Mineral Dry-Shake Floor Hardener: Factory-packaged, dry combination of portland cement, graded quartz aggregate, color pigments, and plasticizing admixture. Use color pigments that are finely ground, nonfading mineral oxides interground with cement.
 - 1. Color: Match Architect's sample.

2.10 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
- F. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.11 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 according to ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types I and II, nonload bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.022-inch-thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- F. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.12 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

2.13 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

- D. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing or admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.
 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
- E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Normal-weight concrete.
1. Minimum Compressive Strength: 5000 psi As indicated at 28 days.
 2. Maximum W/C Ratio: 0.50.
 3. Slump Limit: 4 inches, plus or minus 1 inch.
 4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
 5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
- B. Foundation Walls: Normal-weight concrete.
1. Minimum Compressive Strength: 5000 psi As indicated at 28 days.
 2. Maximum W/C Ratio: 0.50.
 3. Slump Limit: 4 inches, plus or minus 1 inch.
 4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
 5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
- C. Slabs-on-Grade: Normal-weight concrete.
1. Minimum Compressive Strength: 5000 psi or As indicated at 28 days.
 2. Maximum W/C Ratio: 0.50.
 3. Minimum Cementitious Materials Content: 470 lb/cu. yd..
 4. Slump Limit: 4 inches, plus or minus 1 inch.
 5. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
 6. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
 7. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
 8. Steel-Fiber Reinforcement: Add to concrete mixture, according to manufacturer's written instructions, at a rate of 50 lb/cu. yd..
 9. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 1.0 lb/cu. yd..

10. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 4.0 lb/cu. yd..
- D. Suspended Slabs: Normal-weight concrete.
1. Minimum Compressive Strength: 5000 psi As indicated at 28 days.
 2. Maximum W/C Ratio: 0.50.
 3. Minimum Cementitious Materials Content: 470 lb/cu. yd..
 4. Slump Limit: 4 inches, plus or minus 1 inch.
 5. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
 6. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
 7. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
 8. Steel-Fiber Reinforcement: Add to concrete mixture, according to manufacturer's written instructions, at a rate of 50 lb/cu. yd..
 9. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 1.0 lb/cu. yd..
 10. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 4.0 lb/cu. yd..
- E. Concrete Toppings: Normal-weight concrete.
1. Minimum Compressive Strength: 5000 psi Insert strength at 28 days.
 2. Minimum Cementitious Materials Content: 470 lb/cu. yd..
 3. Slump Limit: 4 inches, plus or minus 1 inch.
 4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
 5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
 6. Air Content: Do not allow air content of trowel-finished toppings to exceed 3 percent.
 7. Steel-Fiber Reinforcement: Add to concrete mixture, according to manufacturer's written instructions, at a rate of 50 lb/cu. yd..
 8. Synthetic Micro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 1.0 lb/cu. yd..
 9. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 4.0 lb/cu. yd..
- F. Building Frame Members: Normal-weight concrete.
1. Minimum Compressive Strength: 5000 psi or As indicated at 28 days.
 2. Maximum W/C Ratio: 0.50.
 3. Slump Limit: 4 inches, plus or minus 1 inch.
 4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
 5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

- G. Building Walls: Normal-weight concrete.

1. Minimum Compressive Strength: 5000 psi or As indicated at 28 days.
2. Maximum W/C Ratio: 0.50.
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.

2.15 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.16 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
1. Class A, 1/8 inch for smooth-formed finished surfaces.
 2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.

- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer Do not chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORING AND RESHORING INSTALLATION

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
1. Lap joints 6 inches and seal with manufacturer's recommended tape.
- B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.

3.6 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

- E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.
- G. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780/A 780M. Use galvanized-steel wire ties to fasten zinc-coated steel reinforcement.

3.7 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.8 WATERSTOP INSTALLATION

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

3.9 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces not exposed to public view as shown on drawings.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:
 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
 3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix 1 part portland cement and 1 part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces indicated to receive trowel finish.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces exposed to view.
 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
 3. Finish and measure surface, so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.
1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- F. Slip-Resistive Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
1. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive aggregate over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
 2. After broadcasting and tamping, apply float finish.
 3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate.
- G. Dry-Shake Floor Hardener Finish: After initial floating, apply dry-shake floor hardener to surfaces according to manufacturer's written instructions and as follows:
1. Uniformly apply dry-shake floor hardener at a rate of 100 lb/100 sq. ft. unless greater amount is recommended by manufacturer.
 2. Uniformly distribute approximately two-thirds of dry-shake floor hardener over surface by hand or with mechanical spreader, and embed by power floating. Follow power floating with a second dry-shake floor hardener application, uniformly distributing remainder of material, and embed by power floating.

3. After final floating, apply a trowel finish. Cure concrete with curing compound recommended by dry-shake floor hardener manufacturer and apply immediately after final finishing.

3.12 MISCELLANEOUS CONCRETE ITEM INSTALLATION

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 2. Construct concrete bases 4 inches high unless otherwise indicated, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
 3. Minimum Compressive Strength: 5000 psi at 28 days.
 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
 6. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 7. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.13 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.
 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
1. Defer joint filling until concrete has aged at least **[one]** **[six]** month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials

and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
 - F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a DPMC prequalified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
 1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.
 4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 4. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
 6. Unit Weight: ASTM C 567/C 567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 7. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
 8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
 14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

END OF SECTION

SECTION 033543 - POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Polished concrete finishing.
 - 2. Concrete for polished concrete, including concrete materials, mixture design, placement procedures, initial finishing, and curing is specified in Section 033000 "Cast-in-Place Concrete."
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for concrete not designated as polished concrete.

1.3 DEFINITIONS

- A. Design Reference Sample: Sample designated by Architect in the Contract Documents that reflects acceptable surface quality and appearance of polished concrete.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with polished concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Cast-in-place concrete subcontractor.
 - e. Polished concrete finishing Subcontractor.
 - 2. Review cold- and hot-weather concreting procedures, curing procedures, construction joints, concrete repair procedures, concrete finishing, and protection of polished concrete.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Polishing Schedule: Submit plan showing polished concrete surfaces and schedule of polishing operations for each area of polished concrete before start of polishing operations. Include locations of all joints, including construction joints.

- C. Samples for Initial Selection: For each type of product requiring color selection.
- D. Samples for Verification: For each type of exposed color.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Repair materials.
 - 2. Liquid floor treatments.

1.7 QUALITY ASSURANCE

- A. Field Sample Panels: After approval of verification sample and before casting concrete, produce field sample panels to demonstrate the approved range of selections made under Sample submittals. Produce a minimum of three sets of full-scale panels, approximately 48 by 48 inches minimum, to demonstrate the expected range of finish, color, and appearance variations.
 - 1. Locate panels as indicated or, if not indicated, as directed by Architect.
 - 2. Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
 - 3. Demolish and remove field sample panels when directed.
- B. Mockups: Before casting concrete, build mockups to verify selections made under Sample submittals and to demonstrate typical joints, surface finish, tolerances, and standard of workmanship. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Demonstrate curing, finishing, and protecting of polished concrete.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatments for Polished Concrete Finish: Clear, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. [Advanced Floor Products.](#)
- b. [Euclid Chemical Company \(The\); an RPM company.](#)
- c. [PROSOCO, Inc.](#)
- d. [Vexcon Chemicals Inc.](#)
- e. Approved Equal.

PART 3 - EXECUTION

3.1 POLISHING

- A. Polish: Level 3: High sheen, 800 grit.
- B. Apply polished concrete finish system to cured and prepared slabs to match accepted mockup.
 1. Machine grind floor surfaces to receive polished finishes level and smooth and to depth required to reveal aggregate to match approved mockup.
 2. Apply reactive stain for polished concrete in polishing sequence and according to manufacturer's written instructions.
 3. Apply penetrating liquid floor treatment for polished concrete in polishing sequence and according to manufacturer's written instructions, allowing recommended drying time between successive coats.
 4. Apply penetrating stain for polished concrete in polishing sequence and according to manufacturer's written instructions.
 5. Continue polishing with progressively finer-grit diamond polishing pads to gloss level, to match approved mockup.
 6. Control and dispose of waste products produced by grinding and polishing operations.
 7. Neutralize and clean polished floor surfaces.

END OF SECTION 033543

SECTION 042200 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Concrete masonry units.
2. Mortar and grout.
3. Steel reinforcing bars.
4. Masonry joint reinforcement.
5. Ties and anchors.
6. Embedded flashing.
7. Miscellaneous masonry accessories.

- B. Related Sections:

1. Section 033000 "Cast-in-Place Concrete" for installing dovetail slots for masonry anchors.
2. Section 076200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
 2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.

2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection:

1. Weep holes/vents.

1.6 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Qualification Data: For testing agency.
- C. Material Certificates: For each type and size of the following:
1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 2. Cementitious materials. Include brand, type, and name of manufacturer.
 3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 4. Grout mixes. Include description of type and proportions of ingredients.
 5. Reinforcing bars.
 6. Joint reinforcement.
 7. Anchors, ties, and metal accessories.
- D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
- F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated (and DPMC pre-qualified).
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. Regional Materials: CMUs shall be manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 2. Provide square-edged units for outside corners unless otherwise indicated.
- C. Integral Water Repellent: Provide units made with integral water repellent for exposed units and where indicated.
1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to

ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.

- a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
- 1) ACM Chemistries, Inc.; RainBloc.
 - 2) BASF Aktiengesellschaft; Rheopel Plus.
 - 3) Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block.
 - 4) Approved Equal.

D. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 3050 psi.
2. Density Classification: Normal weight unless otherwise indicated.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
4. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

2.3 MORTAR AND GROUT MATERIALS

- A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- E. Aggregate for Mortar: ASTM C 144.
1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- F. Aggregate for Grout: ASTM C 404.
- G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. Euclid Chemical Company (The); Accelguard 80.
- b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
- c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.
- d. Approved Equal.

H. Water: Potable.

2.4 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
- B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
 1. Interior Walls: Hot-dip galvanized, carbon steel.
 2. Exterior Walls: Hot-dip galvanized, carbon or Stainless steel.
 3. Wire Size for Side Rods: 0.148-inch diameter.
 4. Wire Size for Cross Rods: 0.148-inch diameter.
 5. Wire Size for Veneer Ties: 0.148-inch diameter.
 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.5 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
 1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 641/A 641M, Class 1 coating.
 2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
 3. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
 4. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
 5. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
 6. Stainless-Steel Sheet: ASTM A 666, Type 304.
 7. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 8. Stainless-Steel Bars: ASTM A 276 or ASTM A 666, Type 304.
- B. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated bent to configuration indicated.
 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

2.6 MISCELLANEOUS ANCHORS

- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.

- B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.
- C. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

2.8 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime mortar unless otherwise indicated.
 - 3. For exterior masonry, use portland cement-lime mortar.
 - 4. For reinforced masonry, use portland cement-lime mortar.
 - 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 - 1. For masonry below grade or in contact with earth, use Type M.
 - 2. For reinforced masonry, use Type S.
 - 3. For mortar parge coats, use Type S or Type N.
- D. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
 3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
 1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.

2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

- H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 - 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
 - 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
 - 2. Allow cleaned surfaces to dry before setting.
 - 3. Wet joint surfaces thoroughly before applying mortar.
- D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
 - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
 - 2. Install preformed control-joint gaskets designed to fit standard sash block.
 - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
 - 4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

3.8 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Contractor will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
- B. Inspections: Level 1 special inspections according to the "International Building Code."
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- I. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.9 PARING

- A. Parge exterior faces of below-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat and scarify first coat to ensure full bond to subsequent coat.
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of paring and a cove at bottom.
- C. Damp-cure paring for at least 24 hours and protect paring until cured.

3.10 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.11 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - 1. Crush masonry waste to less than 4 inches in each dimension.
 - 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."
 - 3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

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- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042200

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Steel framing and supports for countertops.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Steel girders for supporting wood frame construction.
5. Steel pipe columns for supporting wood frame construction.
6. Shelf angles.
7. Metal downspout boots.
8. Loose bearing and leveling plates for applications where they are not specified in other Sections.

B. Products furnished, but not installed, under this Section include the following:

1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:

1. Structural Engineering Drawings.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Paint products.

3. Grout.

- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
1. Steel framing and supports for countertops.
 2. Steel framing and supports for mechanical and electrical equipment.
 3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 4. Steel pipe columns for supporting wood frame construction.
 5. Shelf angles.
 6. Metal downspout boots.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
- C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- D. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.
- E. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.
- F. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- G. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- H. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- I. Aluminum Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- J. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- K. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.
- L. Bronze Extrusions: ASTM B 455, Alloy UNS No. C38500 (extruded architectural bronze).
- M. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semi-red brass).
- N. Nickel Silver Extrusions: ASTM B 151/B 151M, Alloy UNS No. C74500.
- O. Nickel Silver Castings: ASTM B 584, Alloy UNS No. C97600 (20 percent leaded nickel bronze).

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
1. Provide stainless-steel fasteners for fastening aluminum.
 2. Provide stainless-steel fasteners for fastening stainless steel.
 3. Provide stainless-steel fasteners for fastening nickel silver.
 4. Provide bronze fasteners for fastening bronze.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.
- D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.
- E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- G. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.
- I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

- A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Shop Primers: Provide primers that comply with Section 0990391 "Historic Treatment of Plain Painting."
- C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- D. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- E. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- F. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- G. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- H. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- I. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- J. Concrete: Comply with requirements in "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi as noted in the Structural Drawings.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.

- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes recommended by partition manufacturer with attached bearing plates, anchors, and braces as recommended by partition manufacturer. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.
- D. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.
 - 1. Provide bearing plates welded to beams where indicated.
 - 2. Drill or punch girders and plates for field-bolted connections where indicated.
 - 3. Where wood nailers are attached to girders with bolts or lag screws, drill or punch holes at 24 inches o.c.

- E. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.
 - 1. Unless otherwise indicated, fabricate from Schedule 40 steel pipe.
 - 2. Unless otherwise indicated, provide 1/2-inch baseplates with four 5/8-inch anchor bolts and 1/4-inch top plates.
- F. Galvanize miscellaneous framing and supports where indicated.
- G. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
 - 1. Provide mitered and welded units at corners.
 - 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize and prime shelf angles located in exterior walls.
- D. Prime shelf angles located in exterior walls with zinc-rich primer.
- E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 METAL DOWNSPOUT BOOTS

- A. Provide downspout boots made from cast iron in heights indicated with inlets of size and shape to suit downspouts. Provide units with flanges and holes for countersunk anchor bolts.
 - 1. Outlet: Vertical, to discharge into pipe.
- B. Prime cast-iron downspout boots with zinc-rich primer.

2.9 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.10 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.

- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.11 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with universal shop primer unless zinc-rich primer is indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 4. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.12 ALUMINUM FINISHES

- A. As-Fabricated Finish: AA-M12.
- B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
1. Cast Aluminum: Heavy coat of bituminous paint.
 2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.
1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055000

SECTION 057300 - DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel and iron decorative railings.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for wood blocking for anchoring railings.

1.3 DEFINITIONS

- A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas and for pedestrian guidance and support, visual separation, or wall protection.

1.4 COORDINATION AND SCHEDULING

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not meet structural performance requirements.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of railings assembled from standard components.
 - 2. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, and attachment details.

- C. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.
- D. Samples for Verification: For each type of exposed finish required.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
 - 2. Fittings and brackets.
 - 3. Welded connections.
 - 4. Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples need not be full height.
- E. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
- E. Preconstruction test reports.
- F. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.8 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockups as shown on Drawings.
 - 2. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches in length.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a DPMC prequalified testing agency to perform preconstruction testing on laboratory mockups. Payment for these services will be made by Contractor. Retesting of products that fail to meet specified requirements shall be done at Contractor's expense.
 - 1. Build laboratory mockups at testing agency facility; use personnel, materials, and methods of construction that will be used at Project site.
 - 2. Test railings according to ASTM E 894 and ASTM E 935.
 - 3. Notify Architect seven days in advance of the dates and times when laboratory mockups will be tested.

1.10 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods, including structural analysis, preconstruction testing, field testing, and in-service performance.
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of railings and are based on the specific system indicated. See Section 016000 "Product Requirements."
 - 1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.
- B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 - 1. Steel: 72 percent of minimum yield strength.

- C. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
 - b. Infill load and other loads need not be assumed to act concurrently.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.3 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.
1. Provide cast-metal brackets with flange tapped for concealed anchorage to threaded hanger bolt.
 2. Provide either formed- or cast-metal brackets with predrilled hole for exposed bolt anchorage.
 3. Provide formed-steel brackets with predrilled hole for bolted anchorage and with snap-on cover that matches rail finish and conceals bracket base and bolt head.

2.4 STEEL AND IRON

- A. Tubing: ASTM A 500/A 500M (cold formed) or ASTM A 513.
- B. Bars: Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.
- C. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- D. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- E. Expanded Metal: ASTM F 1267, Type I (expanded), Class 1 (uncoated).

2.5 FASTENERS

- A. Fastener Materials: Unless otherwise indicated, provide the following:
1. Uncoated Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating where concealed; Type 304 stainless-steel fasteners where exposed.
 2. Galvanized-Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
 3. Dissimilar Metals: Type 316 stainless-steel fasteners.

- B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless exposed fasteners are unavoidable or exposed fasteners are the standard fastening method for railings indicated.
 - 1. Provide Phillips tamper-resistant square or hex socket flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193 or ICC-ES AC308.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

2.6 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting."
- E. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- F. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- G. Shop Primer for Galvanized Steel: Cementitious galvanized metal primer complying with MPI#26.
- H. Intermediate Coats and Topcoats: Provide products that comply with Section 099113 "Exterior Painting."
- I. Epoxy Intermediate Coat: Complying with MPI#77 and compatible with primer and topcoat.
- J. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- K. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

- L. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 - 1. Water-Resistant Product: At exterior locations and where indicated provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.7 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded or nonwelded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds; no evidence of a welded joint.
- I. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
 - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- J. Form changes in direction as follows:
 - 1. As detailed.
 - 2. By bending.
 - 3. By flush bends.

4. By radius bends of radius indicated.
 5. By bending to smallest radius that will not result in distortion of railing member.
- K. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
 - L. Close exposed ends of hollow railing members with prefabricated end fittings.
 - M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch or less.
 - N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 - O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
 - P. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.
 - Q. For removable railing posts, fabricate slip-fit sockets from steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
 1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

2.8 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.9 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 1. Hot-dip galvanize exterior steel and iron railings, including hardware, after fabrication.

2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
 3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
 4. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
 5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
- D. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, but galvanize anchors to be embedded in exterior concrete or masonry.
- E. Preparing Nongalvanized Items for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
1. Shop prime uncoated railings with universal shop primer unless zinc-rich primer is indicated.
 2. Do not apply primer to galvanized surfaces.
- G. Shop-Painted Finish: Comply with Section 099113 "Exterior Painting."
1. Color: As selected by Architect from manufacturer's full range.
- H. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.
1. Color: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.

- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

- A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.
- D. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post.

- E. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For steel railings, weld flanges to posts and bolt to metal-supporting surfaces.
- F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ATTACHING RAILINGS

- A. Anchor railing ends to concrete and masonry with sleeves concealed within railing ends and anchored to wall construction with anchors and bolts.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends using nonwelded connections.
- C. Attach handrails to walls with wall brackets except where end flanges are used. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
 - 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and predrilled hole for exposed bolt anchorage.
 - 2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- D. Secure wall brackets and railing end flanges to building construction as follows:
 - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - 2. For hollow masonry anchorage, use toggle bolts.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a DPMC prequalified testing agency to perform tests and inspections and to prepare test reports. Payment for these services will be made by Contractor.
- B. Extent and Testing Methodology: Testing agency will randomly select completed railing assemblies for testing that are representative of different railing designs and conditions in the completed Work. Test railings according to ASTM E 894 and ASTM E 935 for compliance with performance requirements.
- C. Remove and replace railings where test results indicate that they do not comply with specified requirements unless they can be repaired in a manner satisfactory to Architect and comply with specified requirements.
- D. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

3.7 CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

3.8 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 057300

SECTION 060312 - HISTORIC WOOD REPAIR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes historic treatment of wood in the form of repairing wood features as follows:
 - 1. Repairing wood paneling, trim and siding.
 - 2. Replacing wood paneling, siding and trim.
 - 3. Repairing, refinishing, and replacing hardware.
- B. Related Requirements:
 - 1. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.
 - 2. Section 024296 "Historic Removal and Dismantling" for historic removal and dismantling work.
 - 3. Section 080352 "Historic Treatment of Wood Windows" for historic wood window repairs, including related trim.

1.3 SEQUENCING AND SCHEDULING

- A. Perform historic wood repair in the following sequence, which includes work specified in this and other Sections:
 - 1. Before removing wood components for on-site or off-site repair, tag each component with location-identification numbers. Indicate on tags and building plans the locations of each component, such as "Paneling at Multi-purpose Room on North Side."
 - 2. Dismantle hardware and tag with location-identification numbers.
 - 3. In the shop, label each repaired component and whole or partial replacement with permanent location-identification number in inconspicuous location and remove site-applied tags.
 - 4. Sort units by condition, separating those that need extensive repair.
 - 5. Clean surfaces.
 - 6. General Wood-Repair Sequence:
 - a. Remove paint to bare wood.
 - b. Repair wood by consolidation, replacement, partial replacement, and patching.
 - c. Sand, prime, fill, sand again, and prime surfaces again for refinishing.
 - 7. Repair, refinish, and replace hardware if required. Reinstall operating hardware.
 - 8. Reinstall components.
 - 9. Apply finish coats.
 - 10. Install remaining hardware.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.
- B. Shop Drawings:
 1. Include plans, elevations, and sections showing locations and extent of repair and replacement work, with enlarged details of replacement parts indicating materials, profiles, joinery, reinforcing, method of splicing or attaching wood members to other surfaces, accessory items, and finishes.
 2. Include field-verified dimensions and the following:
 - a. Full-size shapes and profiles with complete dimensions for replacement components and their jointing, showing relationship of existing components to new components.
 - b. Templates and directions for installing hardware and anchorages.
 - c. Identification of each new unit and its corresponding location in the building on annotated plans and elevations.
 - d. Provisions for sealant joints and flashing as required for location.
- C. Samples for Initial Selection: For each type of exposed wood and finish.
 1. Identify wood species, cut, and other features.
 2. Include Samples of hardware and accessories involving color selection.
- D. Samples for Verification: For the following products in manufacturer's standard sizes unless otherwise indicated, finished as required for use in the Work:
 1. Replacement Wood: 12-inch-long, full-size molding sections with applied finish.
 - a. Additional Samples of replacement members that show fabrication techniques, materials, and finishes as requested by Architect.
 2. Repaired Wood: Prepare Samples using existing wood removed from site, repaired, and prepared for refinishing.
 3. Refinished Wood: Prepare Samples using existing wood removed from site, repaired, and refinished.
 4. Hardware: Full-size units with each factory-applied or restored finish.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For historic treatment specialist including workers and wood-repair-material manufacturer.
- B. Wood Historic Treatment Program: Submit before work begins.

1.6 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: A qualified historic wood-repair specialist, experienced in repairing, refinishing, and replacing wood in whole and in part. Experience only in fabricating and installing new woodwork is insufficient experience for wood historic treatment work.
- B. Wood-Repair-Material Manufacturer Qualifications: A firm regularly engaged in producing wood consolidant and wood-patching compound that have been used for similar historic wood-treatment applications with successful results, and with factory-authorized service representatives who are available for consultation, Project-site inspection, and on-site assistance.

- C. Wood Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic treatment work, including protection of surrounding materials and Project site.
 - 1. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.
- D. Mockups: Prepare mockups of historic treatment repair processes to demonstrate aesthetic effects and to set quality standards for materials and execution, and for fabrication and installation. Prepare mockups so they are as inconspicuous as practicable.
 - 1. Locate mockups on existing surfaces where directed by Architect in locations that enable viewing under same conditions as the completed Work.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Pack, deliver, and store products in suitable packs, heavy-duty cartons, or wooden crates; surround with sufficient packing material to ensure that products will not be deformed, broken, or otherwise damaged.
- B. Until installed, store products inside a well-ventilated area and protect from weather, moisture, soiling, abrasion, extreme temperatures, and humidity, and where environmental conditions comply with manufacturer's requirements.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with historic wood repair only when existing and forecasted weather conditions are within the environmental limits set by each manufacturer's written instructions and specified requirements.

PART 2 - PRODUCTS

2.1 HISTORIC WOOD REPAIR, GENERAL

- A. Quality Standard: Comply with applicable requirements in Section 12, "Historic Restoration Work," and related requirements in AWI/AWMAC/WI's "Architectural Woodwork Standards" for construction, finishes, grade rules, and other requirements unless otherwise indicated.
 - 1. Exception: Industry practices cited in Section 12, Article 1.5, "Industry Practices," of the Architectural Woodwork Standards do not apply to the work of this Section.

2.2 REPLICATED WOOD ITEMS

- A. Replicated Wood Paneling and Trim: Custom-fabricated replacement wood units and components.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Adams Architectural Millwork Co., Subsidiary of Dubuque Sash & Door Mfg.
 - b. History Wood Window Restoration.
 - c. Traditional Builders, Inc.
 - d. Wood Window Workshop.
 - e. Or Approved Equal.
2. Joint Construction: Joints matching existing joints.
3. Wood Species: Match species of existing wood.
4. Wood Cut: Match cut of existing wood.
5. Wood Member and Trim Profiles: Match profiles and detail of existing.
6. Hardware: Reuse existing unless otherwise indicated.
7. Date Identification: Emboss on a concealed surface of each replaced item, in easily read characters, "MADE 2018." Manufacturer's name may also be embossed.

2.3 WOOD-REPLACEMENT MATERIALS

- A. Wood, General: Clear fine-grained lumber; kiln dried to a moisture content of 6 to 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide.
 1. Species: Match species of each existing type of wood component or assembly unless otherwise indicated.
- B. Paneling: Match existing species or Ponderosa pine, eastern white pine, or Idaho white pine.
- C. Exterior Trim: Match existing species.
- D. Interior Trim: Match existing species or Ponderosa pine, eastern white pine, or Idaho white pine.

2.4 WOOD-REPAIR MATERIALS

- A. Source Limitations: Obtain wood consolidant and wood-patching compound from single source from single manufacturer.
- B. Wood Consolidant: Ready-to-use product designed to penetrate, consolidate, and strengthen soft fibers of wood materials that have deteriorated due to weathering and decay and designed specifically to enhance the bond of wood-patching compound to existing wood.
 1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Abatron, Inc.; LiquidWood.
 - b. ConServ Epoxy LLC; Flexible Epoxy Consolidant 100.
 - c. Protective Coating Company; PC-Petrifier or PC-Rot Terminator.
 - d. Or Approved Equal.
- C. Wood-Patching Compound: Two-part, epoxy-resin, wood-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of wood repair indicated, tooling time required for

the detail of work, and site conditions. Compound shall be designed for filling voids in damaged wood materials that have deteriorated due to weathering and decay. Compound shall be capable of filling deep holes and spreading to featheredge.

1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Abatron, Inc.; LiquidWood with WoodEpox.
 - b. Advanced Repair Technology, Inc.; Primatrate with Flex-Tec HV.
 - c. ConServ Epoxy LLC; Flexible Epoxy Consolidant 100 with Flexible Epoxy Patch 200.
 - d. Protective Coating Company; PC-Woody.
 - e. System Three Resins, Inc.; Sculpwood.
 - f. Or Approved Equal.

2.5 HARDWARE

- A. Existing hardware to remain and be installed at completion of project.

2.6 MISCELLANEOUS MATERIALS

- A. Borate Preservative Treatment: Inorganic, borate-based solution, with disodium octaborate tetrahydrate as the primary ingredient; manufactured for preserving weathered and decayed wood from further damage caused by fungi and wood-boring insects; complying with AWPA P5; containing no boric acid.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Abatron, Inc.
 - b. Nisus Corporation.
 - c. System Three Resins, Inc.
 - d. Or Approved Equal.
- B. Cleaning Materials:
 1. Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 1/2 cup of laundry detergent that contains no ammonia, 5 quarts of 5 percent sodium hypochlorite bleach, and 15 quarts of warm water for each 5 gal. of solution required.
 2. Mildewcide: Commercial, proprietary mildewcide or a solution prepared by mixing 1/3 cup of household detergent that contains no ammonia, 1 quart of 5 percent sodium hypochlorite bleach, and 3 quarts of warm water.
- C. Adhesives: Wood adhesives with minimum 15- to 45-minute cure at 70 deg F, in gunnable and liquid formulations as recommended in writing by adhesive manufacturer for each type of repair and exposure condition.
- D. Fasteners: Use fastener metals that are noncorrosive and compatible with each material joined.
 1. Match existing fasteners in material and type of fastener unless otherwise indicated.
 2. Use concealed fasteners for interconnecting wood components.
 3. Use concealed fasteners for attaching items to other work unless exposed fasteners are unavoidable or the existing fastening method.

4. For fastening metals, use fasteners of same basic metal as fastened metal unless otherwise indicated.
5. For exposed fasteners, use Phillips-type machine screws of head profile flush with metal surface unless otherwise indicated.
6. Finish exposed fasteners to match finish of metal fastened unless otherwise indicated.

2.7 WOOD FINISHES

- A. Unfinished Replacement Units: Provide exposed exterior and interior wood surfaces of replacement units unfinished; smooth, filled, and suitably prepared for on-site priming and finishing.
- B. Factory-Primed Replacement Units: Manufacturer's standard factory-prime coat on exposed exterior and interior wood surfaces; compatible with indicated finish coating.
- C. Factory-Finished Units: Alkyd finish system consisting of primer and two finish coats on exposed exterior and interior wood surfaces, unless otherwise indicated.
 1. Finish Coats: Match intermediate coat and topcoat products used for nearby, repaired wood, as specified in Section 090391 "Historic Treatment of Plain Painting."
 2. Color and Gloss: Color and gloss to be provided. Assume three-color interior paint scheme except where interior finishes are to be unpainted. One color for walls, one color for trim, doors and windows, and one color for ceiling at the interior. Assume three-color exterior paint scheme for each building component: one color for Carriage House siding, one color for Carriage House trim and one color for Carriage House windows and doors; and one color for addition siding, one color for addition trim and one color for addition windows and doors.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect adjacent materials from damage by historic wood repair.
- B. Clean wood of mildew, algae, moss, plant material, loose paint, grease, dirt, and other debris by scrubbing with bristle brush or sponge and detergent solution. Scrub mildewed areas with mildewcide. After cleaning, rinse thoroughly with fresh water. Allow to dry before repairing or painting.
- C. Condition replacement wood members and replacement units to prevailing conditions at installation areas before installing.

3.2 HISTORIC WOOD REPAIR, GENERAL

- A. Historic Treatment Appearance Standard: Completed work is to have a uniform appearance as viewed by Architect from 5 feet away for interior work and from 20 feet6 m away for exterior work.
- B. General: In treating historic items, disturb them as minimally as possible and as follows:
 1. Stabilize and repair wood to reestablish structural integrity and weather resistance while maintaining the existing form of each item.

2. Remove coatings and apply borate preservative treatment before repair. Remove coatings according to Section 090391 "Historic Treatment of Plain Painting" unless otherwise indicated.
 3. Repair items in place where possible.
 4. Install temporary protective measures to protect wood-treatment work that is indicated to be completed later.
 5. Refinish historic wood according to Section 090391 "Historic Treatment of Plain Painting" unless otherwise indicated.
- C. Mechanical Abrasion: Where mechanical abrasion is needed for the work, use only the gentlest mechanical methods, such as scraping and natural-fiber bristle brushing, that will not abrade wood substrate, reducing clarity of detail. Do not use abrasive methods, such as sanding, wire brushing, or power tools, except as indicated as part of the historic treatment program and as approved by Architect.
- D. Repair and Refinish Existing Hardware: Dismantle hardware; strip paint, repair, and refinish it to match finish samples; and lubricate moving parts just enough to function smoothly.
- E. Repair Wood: Match existing materials and features, retaining as much original material as possible to perform repairs.
1. Unless otherwise indicated, repair wood by consolidating, patching, splicing, or otherwise reinforcing wood with new wood matching existing wood or with salvaged, sound, original wood.
 2. Where indicated, repair wood by limited replacement matching existing material.
- F. Replace Wood: Where indicated, duplicate and replace units with units made from salvaged, sound, original wood or with new wood matching existing wood. Use surviving prototypes to create patterns for duplicate replacements.
1. Do not use substitute materials unless otherwise indicated.
 2. Compatible substitute materials may be used.
- G. Identify removed items with numbering system corresponding to item locations, to ensure reinstallation in same location. Key items to Drawings showing location of each removed unit. Permanently label units in a location that will be concealed after reinstallation.

3.3 WOOD PATCH-TYPE REPAIR

- A. General: Patch wood that exhibits depressions, holes, or similar voids, and that has limited amounts of rotted or decayed wood.
1. Verify that surfaces are sufficiently clean and free of paint residue prior to patching.
 2. Treat wood with wood consolidant prior to application of patching compound. Coat wood surfaces by brushing, applying multiple coats until wood is saturated and refuses to absorb more. Allow treatment to harden before filling void with patching compound.
 3. Remove rotted or decayed wood down to sound wood.
- B. Apply borate preservative treatment to accessible surfaces either before applying wood consolidant or after removing rotted or decayed wood. Apply treatment liberally by brush to joints, edges, and ends; top, sides, and bottom. Allow treatment to dry.

- C. Apply wood-patching compound to fill depressions, nicks, cracks, and other voids created by removed or missing wood.
 - 1. Prime patch area with application of wood consolidant or manufacturer's recommended primer.
 - 2. Mix only as much patching compound as can be applied according to manufacturer's written instructions.
 - 3. Apply patching compound in layers as recommended in writing by manufacturer until the void is completely filled.
 - 4. Sand patch surface smooth and flush with adjacent wood, without voids in patch material, and matching contour of wood member.
 - 5. Clean spilled compound from adjacent materials immediately.

3.4 WOOD-REPLACEMENT REPAIR

- A. General: Replace parts of or entire wood items at locations indicated on Drawings and where damage is too extensive to patch.
 - 1. Remove surface-attached items from wood surface before performing wood-replacement repairs unless otherwise indicated.
 - 2. Verify that surfaces are sufficiently clean and free of paint residue prior to repair.
 - 3. Remove broken, rotted, and decayed wood down to sound wood.
 - 4. Custom fabricate new wood to replace missing wood; either replace entire wood member or splice new wood part into existing member.
 - 5. Secure new wood using finger joints, multiple dowels, or splines with adhesive and nailing to ensure maximum structural integrity at each splice. Use only concealed fasteners. Fill nail holes and patch surface to match surrounding sound wood.
- B. Apply borate preservative treatment to accessible surfaces after replacements are made. Apply treatment liberally by brush to joints, edges, and ends; top, sides, and bottom.
- C. Repair remaining depressions, holes, or similar voids with patch-type repairs.
- D. Clean spilled materials from adjacent surfaces immediately.
- E. Reinstall items removed for repair into original locations.

3.5 FIELD QUALITY CONTROL

- A. Manufacturers Field Service: Engage wood-repair-material manufacturers' factory-authorized service representatives for consultation and Project-site inspection, and provide on-site assistance when requested by Architect.

3.6 ADJUSTMENT

- A. Adjust existing and replacement operating items, hardware, and accessories for a tight fit at contact points and for smooth operation and tight closure. Lubricate hardware and moving parts.

3.7 CLEANING AND PROTECTION

HISTORIC WOOD REPAIR

Restoration and Expansion
Historic Metlar-Bodine House
Piscataway, Middlesex County, NJ
Architects Project No.: 1836C

- A. Protect wood surfaces from contact with contaminating substances resulting from construction operations. Monitor wood surfaces adjacent to and below exterior concrete and masonry during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances contact wood surfaces, remove contaminants immediately.
- B. Clean exposed surfaces immediately after historic wood repair. Avoid damage to coatings and finishes. Remove excess sealants, patching materials, dirt, and other substances.

END OF SECTION 060312

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Framing with timber.
3. Framing with engineered wood products.
4. Wood blocking, cants, and nailers.
5. Wood furring and grounds.
6. Wood sleepers.
7. Utility shelving.
8. Plywood backing panels.

B. Related Requirements:

1. Section 061063 "Exterior Rough Carpentry" for elevated decks and other exterior construction made of wood.
2. Section 061600 "Sheathing."
3. Shop-Fabricated Wood Trusses – See Structural Drawings.

1.3 DEFINITIONS

- A. Exposed Framing: Framing not concealed by other construction.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- C. Timber: Lumber of 5 inches nominal or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
1. NeLMA: Northeastern Lumber Manufacturers' Association.
 2. NLGA: National Lumber Grades Authority.
 3. RIS: Redwood Inspection Service.
 4. SPIB: The Southern Pine Inspection Bureau.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. Evaluation Reports: For the following, from ICC-ES:
1. Wood-preservative-treated wood.
 2. Fire-retardant-treated wood.
 3. Engineered wood products.
 4. Shear panels.
 5. Power-driven fasteners.
 6. Powder-actuated fasteners.
 7. Expansion anchors.
 8. Metal framing anchors.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." for the following:
1. Dimension lumber framing.
 2. Timber.
 3. Laminated-veneer lumber.
 4. Parallel-strand lumber.
 5. Prefabricated wood I-joists.
 6. Rim boards.
 7. Miscellaneous lumber.
- B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 4. Provide dressed lumber, S4S, unless otherwise indicated.
- C. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.
- D. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWWA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
 2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
 - 1. For exposed lumber indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - 4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
 - 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

- A. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade.
 - 1. Application: All interior partitions.
 - 2. Species:
 - a. Hem-fir (north); NLGA.
 - b. Mixed southern pine; SPIB.
 - c. Spruce-pine-fir; NLGA.
 - d. Hem-fir; WCLIB, or WWPA.
 - e. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 - f. Northern species; NLGA.
 - g. Eastern softwoods; NeLMA.
- B. Load-Bearing Partitions: No. 2 grade.
 - 1. Application: Exterior walls and interior load-bearing partitions.
 - 2. Species:
 - a. Hem-fir (north); NLGA.
 - b. Southern pine; SPIB.
 - c. Douglas fir-larch; WCLIB or WWPA.
 - d. Mixed southern pine; SPIB.
 - e. Spruce-pine-fir; NLGA.
 - f. Douglas fir-south; WWPA.
 - g. Hem-fir; WCLIB or WWPA.
 - h. Douglas fir-larch (north); NLGA.
 - i. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
- C. Load-Bearing Partitions: Any species of machine stress-rated dimension lumber with a grade of not less than 2400f-2.0E.

1. Application: Exterior walls and interior load-bearing partitions.
- D. Load-Bearing Partitions: Any species and grade with a modulus of elasticity of at least 1,500,000 psi and an extreme fiber stress in bending of at least 1000 psi for 2-inch nominal thickness and 12-inch nominal width for single-member use.
 1. Application: Exterior walls and interior load-bearing partitions.
- E. Ceiling Joists: Construction or No. 2 grade.
 1. Species:
 - a. Hem-fir (north); NLGA.
 - b. Southern pine; SPIB.
 - c. Douglas fir-larch; WCLIB or WWPA.
 - d. Douglas fir-larch (north); NLGA.
 - e. Mixed southern pine; SPIB.
 - f. Spruce-pine-fir; NLGA.
 - g. Hem-fir; WCLIB or WWPA.
 - h. Douglas fir-south; WWPA.
 - i. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 - j. Northern species; NLGA.
 - k. Eastern softwoods; NeLMA.
- F. Joists, Rafters, and Other Framing Not Listed Above: Select Structural grade.
 1. Species:
 - a. Hem-fir (north); NLGA.
 - b. Southern pine; SPIB.
 - c. Douglas fir-larch; WCLIB or WWPA.
 - d. Mixed southern pine; SPIB.
 - e. Spruce-pine-fir; NLGA.
 - f. Douglas fir-south; WWPA.
 - g. Hem-fir; WCLIB or WWPA.
 - h. Douglas fir-larch (north); NLGA.
 - i. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
- G. Joists, Rafters, and Other Framing Not Listed Above: Any species of machine stress-rated dimension lumber with a grade of not less than 2400f-2.0E.
- H. Joists, Rafters, and Other Framing Not Listed Above: Any species and grade with a modulus of elasticity of at least 1,500,000 psi and an extreme fiber stress in bending of at least 1000 psi for 2-inch nominal thickness and 12-inch nominal width for single-member use.

2.4 ENGINEERED WOOD PRODUCTS

- A. Engineered Wood Products, General: Products shall contain no urea formaldehyde.
- B. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.

- C. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Boise Cascade Corporation.
 - b. Finnforest USA.
 - c. Georgia-Pacific.
 - d. Jager Building Systems Inc.
 - e. Louisiana-Pacific Corporation.
 - f. Pacific Woodtech Corporation.
 - g. Roseburg Forest Products Co.
 - h. Standard Structures Inc.
 - i. Stark Truss Company, Inc.
 - j. West Fraser Timber Co., Ltd.
 - k. Weyerhaeuser Company.
 - l. Or Approved Equal.
 2. Extreme Fiber Stress in Bending, Edgewise: As indicated on Drawings
 3. Modulus of Elasticity, Edgewise: As indicated on Drawings.
- D. Parallel-Strand Lumber or Glulam: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Louisiana-Pacific Corporation.
 - b. Weyerhaeuser Company;
 - c. Anthony-Domtar Inc.; or
 - d. Or Approved Equal.
 2. Extreme Fiber Stress in Bending, Edgewise: 2900 psi for 12-inch nominal-depth members.
 3. Modulus of Elasticity, Edgewise: 2,200,000 psi.
 4. Or, indicated on Drawings.
- E. Wood I-Joists: Prefabricated units, I-shaped in cross section, made with solid or structural composite lumber flanges and wood-based structural panel webs, let into and bonded to flanges. Provide units complying with material requirements of and with structural capacities established and monitored according to ASTM D 5055.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Anthony-Domtar Inc.
 - b. Boise Cascade Corporation.
 - c. Georgia-Pacific.
 - d. J. M. Huber Corporation.
 - e. International Beams Inc.
 - f. International Paper Corporation.
 - g. Jager Building Systems Inc.

- h. Louisiana-Pacific Corporation.
 - i. Nascor Incorporated.
 - j. Pacific Woodtech Corporation.
 - k. Roseburg Forest Products Co.
 - l. Standard Structures Inc.
 - m. Stark Truss Company, Inc.
 - n. Or Approved Equal.
2. Web Material: Either oriented strand board or plywood, complying with DOC PS 1 or DOC PS 2, Exposure 1.
 3. Structural Properties: Provide units with depths and design values not less than those indicated.
 4. Provide units complying with APA PRI-400, factory marked with APA trademark indicating nominal joist depth, joist class, span ratings, mill identification, and compliance with APA standard.

2.5 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 1. Blocking.
 2. Nailers.
 3. Rooftop equipment bases and support curbs.
 4. Cants.
 5. Furring.
 6. Grounds.
 7. Utility shelving.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber
 1. Hem-fir (north); NLGA.
 2. Mixed southern pine; SPIB.
 3. Spruce-pine-fir; NLGA.
 4. Hem-fir; WCLIB or WWPA.
 5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 6. Western woods; WCLIB or WWPA.
 7. Northern species; NLGA.
 8. Eastern softwoods; NeLMA.
- C. For utility shelving, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
 1. Eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Premium or No. 2 Common (Sterling) grade; NeLMA, NLGA, WCLIB, or WWPA.
 2. Mixed southern pine; No. 1 grade; SPIB.
 3. Hem-fir or hem-fir (north); Select Merchantable or No. 1 Common grade; NLGA, WCLIB, or WWPA.
 4. Spruce-pine-fir (south) or spruce-pine-fir; Select Merchantable or No. 1 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
- D. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
 1. Mixed southern pine; No. 2 grade; SPIB.

2. Hem-fir or hem-fir (north); Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
 3. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
 4. Eastern softwoods; No. 2 Common grade; NeLMA.
 5. Northern species; No. 2 Common grade; NLGA.
 6. Western woods; Construction or No. 2 Common grade; WCLIB or WWPA.
- E. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- F. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- G. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.7 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.

- B. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.
- C. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.
- D. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
 - 1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.
- E. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.
- F. Do not splice structural members between supports unless otherwise indicated.
- G. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- H. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal-thickness.
 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
 4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
- I. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- J. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
1. Use inorganic boron for items that are continuously protected from liquid water.
 2. Use copper naphthenate for items not continuously protected from liquid water.
- K. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
1. NES NER-272 for power-driven fasteners.
 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
- L. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.
- M. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
1. Comply with approved fastener patterns where applicable. Before fastening, mark fastener locations, using a template made of sheet metal, plastic, or cardboard.
 2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
 3. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

- D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal-size furring horizontally and vertically at 24 inches o.c.
- C. Furring to Receive Gypsum Board Plaster Lath: Install 1-by-2-inch nominal-size furring vertically at 16 inches o.c.

3.4 WALL AND PARTITION FRAMING INSTALLATION

- A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions and for load-bearing partitions where framing members bearing on partition are located directly over studs. Fasten plates to supporting construction unless otherwise indicated.
 - 1. For exterior walls, provide 2-by-6-inch nominal-size wood studs spaced 16 inches o.c. unless otherwise indicated.
 - 2. For interior partitions and walls, provide 2-by-4-inch nominal-size wood studs spaced 16 inches o.c. unless otherwise indicated.
 - 3. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.
- B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.
- C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.
 - 1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.
 - 2. For load-bearing walls, provide double-jamb studs for openings 60 inches and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated.
- D. Provide diagonal bracing in exterior walls, at both walls of each external corner, at 45-degree angle, full-story height unless otherwise indicated. Use 1-by-4-inch nominal-size boards, let-in flush with faces of studs.

3.5 CEILING JOIST AND RAFTER FRAMING INSTALLATION

- A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
 - 1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal-size or 2-by-4-inch nominal-size stringers spaced 48 inches o.c. crosswise over main ceiling joists.
- B. Rafters: Notch to fit exterior wall plates and use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.
 - 1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
 - 2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.
- C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal-size boards between every third pair of rafters, but not more than 48 inches o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.
- D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

3.6 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Framing with dimension lumber.
 - 2. Wood blocking and nailers.
 - 3. Wood furring and grounds.
 - 4. Wood sleepers.
 - 5. Utility shelving.
 - 6. Plywood backing panels.
- B. Related Requirements:
 - 1. Section 061600 "Sheathing."
 - 2. Shop-Fabricated Wood Trusses – Refer to Structural Drawings.
 - 3. Section 062013 "Exterior Finish Carpentry" for nonstructural carpentry items exposed to view and not specified in another Section.

1.3 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NHLA: National Hardwood Lumber Association.
 - 3. NLGA: National Lumber Grades Authority.
 - 4. SPIB: The Southern Pine Inspection Bureau.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.

3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
1. Preservative-treated wood.
 2. Power-driven fasteners.
 3. Powder-actuated fasteners.
 4. Expansion anchors.
 5. Metal framing anchors.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Certified Wood: Lumber and plywood shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 4. Provide dressed lumber, S4S, unless otherwise indicated.

- C. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
 - 2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
 - 1. For exposed lumber indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 - 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - 4. Wood framing members that are less than 18 inches above the ground in crawl spaces or unexcavated areas.
 - 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

- A. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade of any species.
 - 1. Hem-fir (north); NLGA.
 - 2. Mixed southern pine; SPIB.
 - 3. Spruce-pine-fir; NLGA.
 - 4. Hem-fir; WCLIB or WWPA.
 - 5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 - 6. Northern species; NLGA.
 - 7. Eastern softwoods; NeLMA.
- B. Other Framing: No. 2 grade and any of the following species:
 - 1. Hem-fir (north); NLGA.
 - 2. Southern pine; SPIB.
 - 3. Douglas fir-larch; WCLIB or WWPA.

4. Mixed southern pine; SPIB.
5. Spruce-pine-fir; NLGA.
6. Douglas fir-south; WWPA.
7. Hem-fir; WCLIB or WWPA.
8. Douglas fir-larch (north); NLGA.
9. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 1. Blocking.
 2. Nailers.
 3. Cants.
 4. Furring.
 5. Grounds.
 6. Utility shelving.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber and any of the following species:
 1. Hem-fir (north); NLGA.
 2. Mixed southern pine; SPIB.
 3. Spruce-pine-fir; NLGA.
 4. Hem-fir; WCLIB or WWPA.
 5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 6. Western woods; WCLIB or WWPA.
 7. Northern species; NLGA.
 8. Eastern softwoods; NeLMA.
- C. For utility shelving, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
 1. Eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Premium or No. 2 Common (Sterling) grade; NeLMA, NLGA, WCLIB, or WWPA.
 2. Mixed southern pine, No. 1 grade; SPIB.
 3. Spruce-pine-fir (south) or spruce-pine-fir, Select Merchantable or No. 1 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
- D. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
 1. Mixed southern pine, No. 2 grade; SPIB.
 2. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
 3. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
 4. Eastern softwoods, No. 2 Common grade; NELMA.
 5. Northern species, No. 2 Common grade; NLGA.

- E. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- F. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- G. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: DOC PS 1, Exterior, AC, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.
 - 1. Plywood shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Screws for Fastening to Metal Framing: ASTM C 1002, length as recommended by screw manufacturer for material being fastened.
- F. Lag Bolts: ASME B18.2.1.
- G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.7 MISCELLANEOUS MATERIALS

- A. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
 - 1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- C. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.
- E. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- F. Do not splice structural members between supports unless otherwise indicated.
- G. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- H. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.

2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
 4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
- I. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- J. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
1. Use inorganic boron for items that are continuously protected from liquid water.
 2. Use copper naphthenate for items not continuously protected from liquid water.
- K. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
1. NES NER-272 for power-driven fasteners.
 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
- L. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal-size furring horizontally and vertically at 24 inches o.c.

3.4 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053

SECTION 061063 - EXTERIOR ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Wood fences.
- B. Related Requirements:
 - 1. Section 061533 "Wood Porch Decking."

1.3 DEFINITIONS

- A. Boards: Lumber of less than 2 inches nominal in thickness and 2 inches nominal or greater in width.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- C. Timber: Lumber of 5 inches nominal or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NLGA: National Lumber Grades Authority.
 - 3. RIS: Redwood Inspection Service.
 - 4. SPIB: The Southern Pine Inspection Bureau.
 - 5. WCLIB: West Coast Lumber Inspection Bureau.
 - 6. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

- A. Product Data: For preservative-treated wood products. Include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates:
 - 1. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

- B. Certificates of Inspection: Issued by lumber grading agency for exposed wood products not marked with grade stamp.
- C. Evaluation Reports: For preservative-treated wood products, from ICC-ES.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials under cover and protected from weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

- A. Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by ALSC's Board of Review.
 - 1. Factory mark each item with grade stamp of grading agency.
 - 2. For items that are exposed to view in the completed Work, mark grade stamp on end or back of each piece.
 - 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
 - 4. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content:
 - 1. Boards: 15 percent.
 - 2. Dimension Lumber: 15 percent for 2-inch nominal thickness or less; 19 percent for more than 2-inch nominal thickness.
 - 3. Timber. 19 percent.

2.2 LUMBER

- A. Hand select wood for Insert descriptions of items requiring high-quality appearance for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.
- B. Dimension Lumber: Select Structural No. 1 grade and any of the following species:
 - 1. Hem-fir or hem-fir (North); NLGA, WCLIB, or WWPA.
 - 2. Douglas fir-larch, Douglas fir-larch (North), or Douglas fir-south; NLGA, WCLIB, or WWPA.
 - 3. Mixed southern pine; SPIB.
 - 4. Redwood; RIS.
- C. Dimension Lumber: Heart B or Select Heart redwood; RIS.
- D. Boards: Any of the following species and grades:

1. Douglas fir, C & Btr finish or C Select; NLGA, WCLIB, or WWPA.
 2. Hem-fir, C & Btr finish or C Select; NLGA, WCLIB, or WWPA.
 3. Redwood, Heart Clear; RIS.
 4. Southern pine, B & B finish; SPIB.
 5. Western red cedar, Clear Heart; NLGA, WCLIB, or WWPA.
- E. Boards: Any of the following species and grades:
1. Eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Premium or No. 2 Common (Sterling) grade; NeLMA, NLGA, WCLIB, or WWPA.
 2. Mixed southern pine; No. 1 grade; SPIB.
 3. Hem-fir or hem-fir (North); Select Merchantable or No. 1 Common grade; NLGA, WCLIB, or WWPA.
 4. Northern white cedar, No. 1 Common; NeLMA or NLGA.

2.3 POSTS

- A. Dimension Lumber Posts: No. 2 grade and any of the following species:
1. Hem-fir or hem-fir (North); NLGA, WCLIB, or WWPA.
 2. Douglas fir-larch, Douglas fir-larch (North), or Douglas fir-south; NLGA, WCLIB, or WWPA.
 3. Mixed southern pine; SPIB.
 4. Spruce-pine-fir or spruce-pine-fir (South); NeLMA, NLGA, WCLIB, or WWPA.
 5. Northern species; NLGA.
 6. Eastern softwoods; NeLMA.
- B. Timber Posts: Balsam fir, Douglas fir-larch, Douglas fir-larch (North), eastern hemlock tamarack (North), hem-fir, southern pine, western hemlock, or western hemlock (North); No. 1; NeLMA, NLGA, SPIB, WCLIB, or WWPA.
- C. Timber Posts: Southern pine; No. 1; SPIB.

2.4 PRESERVATIVE TREATMENT

- A. Pressure treat boards and dimension lumber with waterborne preservative according to AWWA U1; Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
- B. Pressure treat timber with waterborne preservative according to AWWA U1; Use Category UC4a.
1. Treatment with CCA shall include post-treatment fixation process.
- C. Preservative Chemicals: Acceptable to authorities having jurisdiction.
1. Do not use chemicals containing arsenic or chromium except for poles.
- D. Use process for boards and dimension lumber that does not include water repellents or other substances that might interfere with application of indicated finishes.
- E. After treatment, redry dimension lumber to 19 percent maximum moisture content.

- F. Mark treated wood with treatment quality mark of an inspection agency approved by ALSC's Board of Review.
- G. Application: Treat all wood unless otherwise indicated.

2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.
 - 1. Use stainless steel unless otherwise indicated.
 - 2. For pressure-preservative-treated wood, use stainless steel fasteners.
 - 3. For redwood, use stainless steel fasteners.
- B. Nails: ASTM F1667.
- C. Power-Driven Fasteners: ICC-ES AC70.
- D. Wood Screws and Lag Screws: ASME B18.2.1, ASME B18.6.1, or ICC-ES AC233.
- E. Carbon-Steel Bolts: ASTM A307 with ASTM A563 hex nuts and, where indicated, flat washers all hot-dip zinc coated.
- F. Stainless Steel Bolts: ASTM F593, Alloy Group 1 or 2; with ASTM F594, Alloy Group 1 or 2 hex nuts and, where indicated, flat washers.
- G. Postinstalled Anchors: Stainless steel, anchors with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing according to ASTM E488, conducted by a qualified independent testing and inspecting agency.
 - 1. Stainless steel bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

2.6 METAL ACCESSORIES

- A. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, [G60] [G90] [G185] coating designation.
- B. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prime wood indicated to be painted, including both faces and edges. Cut to required lengths and prime ends. Comply with requirements in Section 099113 "Exterior Painting."

3.2 INSTALLATION

- A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.
- B. Framing Standard: Comply with AF&PA WCD1 unless otherwise indicated.
- C. Install metal framing anchors to comply with manufacturer's written instructions.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- F. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of members or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- G. Apply copper naphthenate field treatment to comply with AWPAM4, to cut surfaces of preservative-treated lumber.
- H. Securely attach exterior rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. ICC-ES AC70 for power-driven fasteners.
 - 2. "Fastening Schedule" in ICC's International Building Code.
 - 3. "Fastener Schedule for Structural Members" and "Alternate Attachments" in ICC's International Residential Code for One- and Two-Family Dwellings.
- I. Use common wire nails unless otherwise indicated. Select fasteners of size that do not fully penetrate members where opposite side is exposed to view. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads unless otherwise indicated.

END OF SECTION 061063

SECTION 061533 - WOOD PORCH DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wood decking.
2. Plastic decking.
3. Stairs for elevated decks.
4. Railings for elevated decks.
5. Wood benches for elevated decks.
6. Support framing for elevated decks.

B. Related Requirements:

1. Section 072500 "Weather Barriers" for flexible flashing used with patio decking.
2. Section 076200 "Sheet Metal Flashing and Trim" for sheet metal flashing used with patio decking.

1.3 DEFINITIONS

- A. Boards: Lumber of less than 2 inches nominal in thickness and 2 inches nominal or greater in width.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- C. Timber: Lumber of 5 inches nominal or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 2. NLGA: National Lumber Grades Authority.
 3. RIS: Redwood Inspection Service.
 4. SPIB: The Southern Pine Inspection Bureau.
 5. WCLIB: West Coast Lumber Inspection Bureau.
 6. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

- A. Product Data: For [preservative-treated wood products] [plastic decking] [and] [metal framing anchors].

1. For preservative-treated wood products. Include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
 2. For **[plastic decking] [and] [metal framing anchors]**. Include installation instructions.
- B. Sustainable Design Submittals:
1. [<Double click to insert sustainable design text for regional materials.>](#)
 2. [<Double click to insert sustainable design text for certified wood.>](#)
 3. [<Double click to insert sustainable design text for certified wood.>](#)
- C. Samples: For plastic decking, not less than 24 inches long, showing the range of variation to be expected in appearance of decking, including surface texture.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates:
1. For lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by ALSC's Board of Review.
 2. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained. **[For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.]**
- B. Certificates of Inspection: Issued by lumber grading agency for exposed wood products not marked with grade stamp.
- C. Evaluation Reports: For the following, from ICC-ES:
1. Preservative-treated wood products.
 2. Plastic decking.
 3. Expansion anchors.
 4. Metal framing anchors.
 5. Decking fasteners.

1.6 QUALITY ASSURANCE

- A. [<Double click to insert sustainable design text for manufacturer qualifications.>](#)
- B. [<Double click to insert sustainable design text for vendor qualifications.>](#)

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials under cover and protected from weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.
- B. Handle and store plastic lumber to comply with manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

- A. Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by ALSC's Board of Review.
1. Factory mark each item with grade stamp of grading agency.
 2. For items that are exposed to view in the completed Work, **[mark grade stamp on end or back of each piece] [or] [omit grade stamp and provide certificates of grade compliance issued by grading agency].**
 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
 4. Provide dressed lumber, S4S, unless otherwise indicated.
- B. <Double click to insert sustainable design text for regional wood materials.>
- C. <Double click to insert sustainable design text for certified wood.>
- D. Maximum Moisture Content:
1. Boards: **[15] [19]** percent.
 2. Dimension Lumber: **[15 percent] [19 percent] [15 percent for 2-inch nominal thickness or less; 19 percent for more than 2-inch nominal thickness] [15 percent for 2-inch nominal thickness or less; no limit for more than 2-inch nominal thickness] [19 percent for 2-inch nominal thickness or less; no limit for more than 2-inch nominal thickness].**
 3. Timber. **[19 percent] [No limit].**

2.2 WOOD DECKING[AND STAIR TREADS]

- A. Hand select wood for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.
- B. Dimension Lumber Decking[**and Stair Treads**]: **[No. 2] [Construction or No. 2]** grade and[**any of**] the following species:
1. Hem-fir or hem-fir (North); NLGA, WCLIB, or WWPA.
 2. Douglas fir-larch, Douglas fir-larch (North), or Douglas fir-south; NLGA, WCLIB, or WWPA.
 3. Mixed southern pine; SPIB.
 4. Redwood; RIS.
- C. Dimension Lumber Decking[and Stair Treads]: [Deck Heart or Construction Heart] [Deck Common or Construction Common] redwood; RIS.
- D. Board **[Decking] [and] [Stair Treads]**: **[1-1/4-inch] [1-inch] [3/4-inch]** actual thickness radius-edged decking of[**any of**] the following species and grades:
1. Douglas fir-larch or Douglas fir-south, **[Patio 1] [Patio 2]**; WWPA.

2. Douglas fir-larch, [**Select Dex**] [**Commercial Dex**]; WCLIB.
 3. Douglas fir-larch (North), [**Select Patio**] [**Commercial Patio**]; NLGA.
 4. Hem-fir, [**Patio 1**] [**Patio 2**]; WWPA.
 5. Hem-fir, [**Select Dex**] [**Commercial Dex**]; WCLIB.
 6. Hem-fir (North), [**Select Patio**] [**Commercial Patio**]; NLGA.
 7. Redwood, [**Heart Clear**] [**Heart B or Select Heart**]; RIS.
 8. Southern pine, [**Premium**] [**Standard**]; SPIB.
 9. Western red cedar, [**Patio 1**] [**Patio 2**]; WWPA.
 10. Western red cedar, [**Select Dex**] [**Commercial Dex**]; WCLIB.
 11. Western red cedar (North), [**Select Patio**] [**Commercial Patio**]; NLGA.
- E. Board Stair Treads: [**1-1/4-inch**] [**1-inch**] [**3/4-inch**] actual thickness stepping with half-round or rounded-edge nosing and[**any of**] the following species and grades:
1. Douglas fir, C & Btr VG (Vertical Grain) stepping; NLGA, WCLIB, or WWPA.
 2. Hem-fir, C & Btr VG (Vertical Grain) stepping; NLGA, WCLIB, or WWPA.
 3. Redwood, [**Heart Clear**] [**Heart B or Select Heart**]; RIS.
 4. Southern pine, [**Edge Grain B & B stepping**] [**Near Rift B & B stepping**] [**B & B stepping**]; SPIB.
- F. Board Decking[**and Stair Treads**]: [**1-1/4-inch**] [**1-inch**] [**3/4-inch**] actual thickness radius-edged S4S boards, with one face free of planer skip, machine burn, and torn or chipped grain.
1. Species: [**Ipe**] [**Teak**] [**Cumaru**] [**Garapa**] [**Goncalo alves**] <Insert name>.
 2. Grade Characteristics:
 - a. Clear[**one face; small pin knots and worm holes allowed on back face**].
 - b. Sound; small pin knots, worm holes, and fixed knots allowed.
 - c. All heart[**one face**].
 - d. Straight grained and parallel cut.
 - e. Free of heart centers.
 - f. No decay, incipient decay, honeycomb, knot holes, shakes, splits, or wane.
 - g. No discoloration.

2.3 WOOD RAILINGS

- A. Hand select wood for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.
- B. Dimension Lumber Railing Members: [**Select Structural**] [**No. 1**] [**No. 2**] [**Construction or No. 2**] grade and[**any of**] the following species:
1. Hem-fir or hem-fir (North); NLGA, WCLIB, or WWPA.
 2. Douglas fir-larch, Douglas fir-larch (North), or Douglas fir-south; NLGA, WCLIB, or WWPA.
 3. Mixed southern pine; SPIB.
 4. Redwood; RIS.
 5. Spruce-pine-fir or spruce-pine-fir (South); NeLMA, NLGA, WCLIB, or WWPA.
- C. Dimension Lumber Railing Members: [**Heart Clear**] [**Heart B or Select Heart**] redwood; RIS.

- D. Railing Boards:[Any of the following species and grades:]
1. Douglas fir, C & Btr finish or C Select; NLGA, WCLIB, or WWPA.
 2. Hem-fir, C & Btr finish or C Select; NLGA, WCLIB, or WWPA.
 3. Redwood, **[Heart Clear] [Heart B or Select Heart]**; RIS.
 4. Southern pine, B & B finish; SPIB.
- E. Railing Boards: Radius-edged [Ipe] [Teak] S4S boards, [same grade as decking] [clear] [clear all heart] [, straight grained and parallel cut].

2.4 WOOD BENCHES

- A. Dimension Lumber for Benches: **[Select Structural] [No. 1]** grade and[**any of**] the following species:
1. Hem-fir or hem-fir (North); NLGA, WCLIB, or WWPA.
 2. Douglas fir-larch, Douglas fir-larch (North), or Douglas fir-south; NLGA, WCLIB, or WWPA.
 3. Mixed southern pine; SPIB.
 4. Redwood; RIS.
 5. Spruce-pine-fir or spruce-pine-fir (South); NeLMA, NLGA, WCLIB, or WWPA.
- B. Dimension Lumber for Benches: **[Heart Clear] [Heart B or Select Heart]** redwood; RIS.
- C. Boards for Benches:[Any of the following species and grades:]
1. Douglas fir, C & Btr finish or C Select; NLGA, WCLIB, or WWPA.
 2. Hem-fir, C & Btr finish or C Select; NLGA, WCLIB, or WWPA.
 3. Redwood, **[Heart Clear] [Heart B or Select Heart]**; RIS.
 4. Southern pine, **[Edge Grain B & B finish] [Near Rift B & B finish] [B & B finish]**; SPIB.
- D. Boards for Benches: Radius-edged [Ipe] [Teak] S4S boards, [same grade as decking] [clear] [clear all heart] [, straight grained and parallel cut].

2.5 DIMENSION LUMBER FRAMING

- A. Deck[and Stair] Framing: [Select Structural] [No. 1] [No. 2] [Construction or No. 2] [Construction, Stud, or No. 3] grade and[any of] the following species:
1. Hem-fir (North); NLGA.
 2. Southern pine; SPIB.
 3. Douglas fir-larch; WCLIB or WWPA.
 4. Mixed southern pine; SPIB.
 5. Spruce-pine-fir; NLGA.
 6. Douglas fir-south; WWPA.
 7. Hem-fir; WCLIB or WWPA.
 8. Douglas fir-larch (North); NLGA.
 9. Spruce-pine-fir (South); NeLMA, WCLIB, or WWPA.
- B. Deck[and Stair] Framing: Any species and grade with a modulus of elasticity of at least **[1,500,000 psi] [1,300,000 psi] [1,100,000 psi] [1,000,000 psi] [900,000 psi]** and an extreme fiber stress in

bending of at least **[1000 psi]** **[850 psi]** **[700 psi]** **[600 psi]** **[500 psi]** for 2-inch nominal thickness and 12-inch nominal width for single-member use.

2.6 POSTS

- A. Dimension Lumber Posts: **[No. 2]** **[Construction or No. 2]** **[Construction, Stud, or No. 3]** grade and **[any of]** the following species:
1. Hem-fir or hem-fir (North); NLGA, WCLIB, or WWPA.
 2. Douglas fir-larch, Douglas fir-larch (North), or Douglas fir-south; NLGA, WCLIB, or WWPA.
 3. Mixed southern pine; SPIB.
 4. Spruce-pine-fir or spruce-pine-fir (South); NeLMA, NLGA, WCLIB, or WWPA.
 5. Northern species; NLGA.
 6. Eastern softwoods; NeLMA.
 7. Western woods; WCLIB or WWPA.
- B. Timber Posts: Balsam fir, Douglas fir-larch, Douglas fir-larch (North), eastern hemlock tamarack (North), hem-fir, southern pine, western hemlock, or western hemlock (North); **[No. 1]** **[No. 2]**; NeLMA, NLGA, SPIB, WCLIB, or WWPA.
- C. Timber Posts: Alaska cedar; **[No. 1]** **[No. 2]**; WCLIB.
- D. Timber Posts: Southern pine; **[No. 1]** **[No. 2]**; SPIB.
- E. Round Wood Poles: Clean-peeled wood poles complying with ASTM D3200, with at least 80 percent of inner bark removed and with knots and limbs cut flush with the surface.
1. Species: **<Insert species required>**.

2.7 PRESERVATIVE TREATMENT

- A. Pressure treat boards and dimension lumber with waterborne preservative according to AWPA U1; Use Category UC3b[for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground].
- B. Pressure treat timber with waterborne preservative according to AWPA U1; Use Category UC4a.
- C. Pressure treat poles with waterborne preservative according to AWPA U1; Use Category UC4a.
- D. Preservative Chemicals: Acceptable to authorities having jurisdiction.
1. Do not use chemicals containing arsenic or chromium **[except for timber posts]** **[except for poles]**.
- E. Use process **[for boards and dimension lumber]** that includes water-repellent treatment.
- F. Use process **[for boards and dimension lumber]** that does not include water repellents or other substances that might interfere with application of indicated finishes.

- G. After treatment, redry [**boards**] [**dimension lumber**] [**timber**] [**and**] [**poles**] to 19 percent maximum moisture content.
- H. Mark treated wood with treatment quality mark of an inspection agency approved by ALSC's Board of Review.
1. For items indicated to receive a stained or natural finish, [**mark each piece on surface that will not be exposed**] [**or**] [**omit marking and provide certificates of treatment compliance issued by inspection agency**].
- I. Application: [Treat all wood unless otherwise indicated.] [Treat items indicated on Drawings and the following:]
1. Framing members[**less than 18 inches above grade**].
 2. Sills and ledgers.
 3. Members in contact with masonry or concrete.
 4. Posts.
 5. Round wood poles.
 6. Decking.
 7. Stair treads.

2.8 PLASTIC DECKING

- A. Plastic Lumber, General: Products acceptable to authorities having jurisdiction with current model code evaluation reports that show compliance with building code in effect for Project for indicated type of construction.
1. Allowable loads and spans, as documented in evaluation reports or in information referenced in evaluation reports, shall not be less than design loads and spans indicated.
- B. Composite Plastic Lumber: [**Solid**] [**or**] [**hollow**] shapes made from a mixture of cellulose fiber and polyethylene or polypropylene.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
 2. Decking Standard: [**ICC-ES AC109**] [**or**] [**ICC-ES AC174**].
 3. Decking Size: [**7/8 by 5-1/2 inches actual**] [**1-1/4 by 6 nominal, 1 by 5-1/2 inches actual**] [**1-1/2 by 6 nominal, 1-1/4 by 5-1/2 inches actual**] [**1-1/4 by 6 inches actual**] [**1-3/8 by 3-1/2 inches actual**] [**1-3/8 by 5-1/2 inches actual**] [**2 by 6 nominal, 1-1/2 by 5-1/2 inches actual**] **<Insert dimensions>**.
 4. Configuration: Provide product with grooved edges designed for fastening with concealed decking fasteners.
 5. Surface Texture: [**Woodgrain**] [**Smooth**] [**Manufacturer's standard**] **<Insert finish>**.
 6. Color: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**] **<Insert color>**.
- C. All-Plastic Lumber: [**Solid**] [**or**] [**hollow**] shapes made from high-density polyethylene (HDPE), PVC, polystyrene, or cellular PVC with no cellulose fiber.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
 2. Decking Standard: ICC-ES AC174.

3. Decking Size: [1 by 6 inches actual] [1-1/4 by 6 nominal, 1 by 5-1/2 inches actual] [1-1/2 by 6 nominal, 1-1/4 by 5-1/2 inches actual] [2 by 4 nominal, 1-1/2 by 3-1/2 inches actual] [2 by 6 nominal, 1-1/2 by 5-1/2 inches actual] [1-5/8 by 5-3/4 inches actual] <Insert dimensions>.
4. Configuration: Provide product with [grooved edges designed for fastening with concealed decking fasteners] [or] [tongue-and-groove edges designed for concealed fastening].
5. Surface Texture: [Woodgrain] [Smooth] [Manufacturer's standard] <Insert finish>.
6. Color: [As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range] <Insert color>.

2.9 FASTENERS

- A. General: Provide fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.
 1. Use [stainless steel] [fasteners with hot-dip zinc coating complying with ASTM A153/A153M or ASTM F2329] unless otherwise indicated.
 2. For pressure-preservative-treated wood, use stainless steel fasteners.
 3. For [plastic] [wood] decking, use stainless steel fasteners[where fasteners are exposed to view].
 4. For redwood, use [brass/bronze] [stainless steel] [hot-dip galvanized-steel] fasteners.
- B. Nails: ASTM F1667.
- C. Power-Driven Fasteners: ICC-ES AC70.
- D. Wood Screws and Lag Screws: ASME B18.2.1, ASME B18.6.1, or ICC-ES AC233.
- E. Carbon-Steel Bolts: ASTM A307 with ASTM A563 hex nuts and, where indicated, flat washers all hot-dip zinc coated.
- F. Stainless Steel Bolts: ASTM F593, Alloy Group 1 or 2; with ASTM F594, Alloy Group 1 or 2 hex nuts and, where indicated, flat washers.
- G. Postinstalled Anchors: Stainless steel, [chemical] [or] [torque-controlled expansion] anchors with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing according to ASTM E488 conducted by a qualified independent testing and inspecting agency.
 1. Stainless steel bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

2.10 METAL FRAMING ANCHORS

- A. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those [indicated on Drawings] [of basis-of-design products] [of products of manufacturers listed]. Manufacturer's published values shall be determined from

empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

- C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, [**G60**] [**G90**] [**G185**] coating designation.
- D. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, [**Type 304**] [**Type 316**].
- E. Joist Hangers: U-shaped, with 2-inch-long seat and 1-1/4-inch-wide nailing flanges at least 85 percent of joist depth.
 - 1. Thickness: [**0.050 inch**] [**0.062 inch**].
- F. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.
 - 1. Strap Width: [**1-1/2 inches**] [**2 inches**].
 - 2. Thickness: [**0.050 inch**] [**0.062 inch**].
- G. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch above base and with 2-inch-minimum side cover, socket 0.062 inch thick, and standoff and adjustment plates 0.108 inch thick.
- H. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.
 - 1. Width: [**3/4 inch**] [**1-1/4 inches**].
 - 2. Thickness: [**0.050 inch**] [**0.062 inch**].
 - 3. Length: [**16 inches**] [**24 inches**] [**As indicated**].

2.11 CONCEALED DECKING FASTENERS

- A. Deck Splines: Corrosion-resistant metal or plastic splines that fit in grooves routed into the sides of decking material and are fastened to deck framing with screws. Splines provide uniform spacing of decking material.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- B. Deck Clips: Black-oxide-coated, stainless steel clips designed to be fastened to deck framing with screws, and to secure decking material with teeth that also provide uniform spacing of decking material.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- C. Deck Tracks: Formed metal strips designed to be fastened to deck framing and to secure decking material from underside with screws. Made from epoxy-powder-coated, hot-dip galvanized steel or stainless steel.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Prime wood[**indicated to be painted**], including both faces and edges. Cut to required lengths and prime ends. Comply with requirements in Section 099113 "Exterior Painting."
- C. Stain wood[**indicated to be stained**], including both faces and edges. Cut to required lengths and stain ends. Comply with requirements in Section 099300 "Staining and Transparent Finishing."

3.3 INSTALLATION, GENERAL

- A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.
- B. Framing Standard: Comply with AF&PA WCD1 unless otherwise indicated.
- C. Install wood decking[**and stair treads**] with crown up (bark side down).
- D. Install plastic lumber to comply with manufacturer's written instructions.
- E. Secure decking to framing with [**deck splines**] [**deck clips**] [**deck tracks**] [**or**] [**screws**].
- F. Install metal framing anchors to comply with manufacturer's written instructions.
- G. Do not splice structural members between supports unless otherwise indicated.
- H. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
- I. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of members or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- J. Apply copper naphthenate field treatment to comply with AWPAM4, to cut surfaces of preservative-treated lumber.

- K. Securely attach exterior rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
1. ICC-ES AC70 for power-driven fasteners.
 2. "Fastening Schedule" in ICC's International Building Code.
 3. "Fastener Schedule for Structural Members" and "Alternate Attachments" in ICC's International Residential Code for One- and Two-Family Dwellings.
- L. Use common wire nails unless otherwise indicated. Select fasteners of size that do not fully penetrate members where opposite side is exposed to view. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads unless otherwise indicated.
- M. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced and with adjacent rows staggered.

3.4 INSTALLATION OF ELEVATED DECK JOIST FRAMING

- A. General: Install joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists where framed into wood supporting members by using wood ledgers as indicated or, if not indicated, by using metal joist hangers. Do not notch joists.
- B. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.
- C. Lap members framing from opposite sides of beams or girders not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.
- D. Provide solid blocking of 2-inch nominal thickness by depth of joist at intervals of 96 inches o.c., between joists.

3.5 INSTALLATION OF STAIRS

- A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:
1. Stringer Size: 2 by 12 inches nominal, minimum.
 2. Notching: Notch stringers to receive treads, risers, and supports; leave at least 3-1/2 inches of effective depth.
 3. Stringer Spacing: At least three stringers for each 36-inch clear width of stair.
- B. Provide stair framing with no more than **3/16-inch variation between adjacent treads and risers and no more than** 3/8-inch variation between largest and smallest treads and risers within each flight.
- C. Treads and Risers: Secure by gluing and **[nailing] [screwing]** to carriages. Countersink fastener heads, fill flush, and sand filler. Extend treads over carriages **[and finish with bullnose edge]**.

3.6 INSTALLATION OF RAILINGS

- A. Balusters: Fit to railings, [**glue, and**] [**nail**] [**screw**] in place. Countersink fastener heads, fill flush, and sand filler.
- B. Newel Posts: Secure to stringers and risers with [through bolts] [lag screws] [countersunk-head wood screws and glue].
- C. Railings: Secure wall rails with metal brackets. Fasten freestanding railings to newel posts and to trim at walls with countersunk-head wood screws or rail bolts[**and glue**].

END OF SECTION 061533

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.
3. Subflooring.
4. Underlayment.
5. Sheathing joint and penetration treatment.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" and Section 061053 "Miscellaneous Rough Carpentry".

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For following products, from ICC-ES:

1. Preservative-treated plywood.
2. Fire-retardant-treated plywood.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

2.2 WOOD PANEL PRODUCTS

- A. Emissions: Products shall meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Certified Wood: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":
 - 1. Plywood.
 - 2. Oriented strand board.
 - 3. Fiberboard wall sheathing.
 - 4. Particleboard underlayment.
 - 5. Hardboard underlayment.
- C. Plywood: DOC PS 1.
- D. Oriented Strand Board: DOC PS 2.
- E. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- F. Factory mark panels to indicate compliance with applicable standard.

2.3 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.4 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Use treatment that does not promote corrosion of metal fasteners.
 - 2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
 - 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
 - 4. Design Value Adjustment Factors: Treated lumber plywood shall be tested according ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified.
- C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.
- E. Application: Treat plywood indicated on Drawings, and the following:
 - 1. Roof and wall sheathing within 48 inches of fire walls.
 - 2. Roof sheathing.
 - 3. Subflooring and underlayment for raised platforms.

2.5 WALL SHEATHING

- A. Plywood Wall Sheathing: Exterior, Structural I sheathing.
 - 1. Span Rating: Not less than 16/0.
 - 2. Nominal Thickness: Not less than 3/4 inch.
 - 3. Joinery: Tongue-and-Groove.

2.6 ROOF SHEATHING

- A. Plywood Roof Sheathing: Exterior, Structural I sheathing.
 - 1. Span Rating: Not less than 16/0.
 - 2. Nominal Thickness: Not less than 3/4 inch.
 - 3. Joinery: Tongue-and-Groove

2.7 SUBFLOORING AND UNDERLAYMENT

- A. Plywood Subflooring: Exterior, Structural I single-floor panels or sheathing.
 - 1. Span Rating: Not less than 16 o.c..
 - 2. Nominal Thickness: Not less than 7/8 inch.
 - 3. Joinery: Tongue-and-Groove
- B. Underlayment, General: Provide underlayment in nominal thicknesses indicated or, if not indicated, not less than 1/4 inch over smooth subfloors and not less than 3/8 inch over board or uneven subfloors.
- C. Plywood Underlayment for Resilient Flooring: DOC PS 1, Exterior A-C with fully sanded face.
- D. Plywood Underlayment for Carpet: DOC PS 1, Exterior, C-C Plugged.

2.8 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For roof and wall sheathing, provide fasteners of Type 304 stainless steel unless otherwise indicated on Drawings.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.

2.9 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
 - 1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 1. NES NER-272 for power-driven fasteners.
 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's "International Residential Code for One- and Two-Family Dwellings."
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 1. Combination Subfloor-Underlayment:
 - a. Glue and nail to wood framing.
 - b. Screw to cold-formed metal framing.
 - c. Space panels 1/8 inch apart at edges and ends.
 2. Subflooring:
 - a. Glue and nail to wood framing.

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- b. Screw to cold-formed metal framing.
- c. Space panels 1/8 inch apart at edges and ends.
- 3. Wall and Roof Sheathing:
 - a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
 - b. Screw to cold-formed metal framing.
 - c. Space panels 1/8 inch apart at edges and ends.
- 4. Underlayment:
 - a. Nail to subflooring.
 - b. Space panels 1/32 inch apart at edges and ends.
 - c. Fill and sand edge joints of underlayment receiving resilient flooring immediately before installing flooring.

END OF SECTION 061600

SECTION 062013 - EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior wood trim (pre-finished).

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view and for framing exposed to view.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
2. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
4. Include copies of warranties from chemical-treatment manufacturers for each type of treatment.

- B. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.

C. Samples for Verification:

1. For each species and cut of lumber and panel products, with 1/2 of exposed surface finished; 50 sq. in. for lumber and 8 by 10 inches for panels.

1.4 INFORMATIONAL SUBMITTALS

A. Compliance Certificates:

1. For lumber that is not marked with grade stamp.
2. For preservative-treated wood that is not marked with treatment-quality mark.
3. For fire-retardant-treated wood that is not marked with classification marking of testing and inspecting agency.

B. Evaluation Reports: For the following, from ICC-ES:

Connolly & Hickey Historical Architects, LLC
07/01/2021

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1. Wood-preservative-treated wood.

C. Sample Warranties: For manufacturer's warranties.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

1.7 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.
1. For exterior ornamental wood columns, comply with manufacturer's written instructions and warranty requirements.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Regional Materials: The following wood products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
1. Exterior trim.
- B. Certified Wood: The following wood products shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":
1. Exterior trim.
- C. Lumber: DOC PS 20 and the following grading rules:
1. NeLMA: Northeastern Lumber Manufacturers' Association, "Standard Grading Rules for Northeastern Lumber."

2. NLGA: National Lumber Grades Authority, "Standard Grading Rules for Canadian Lumber."
 3. RIS: Redwood Inspection Service, "Standard Specifications for Grades of California Redwood Lumber."
 4. SPIB: The Southern Pine Inspection Bureau, "Standard Grading Rules for Southern Pine Lumber."
 5. WCLIB: West Coast Lumber Inspection Bureau, Standard No. 17, "Grading Rules for West Coast Lumber."
 6. WWPA: Western Wood Products Association, "Western Lumber Grading Rules."
- D. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
1. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.
- E. Softwood Plywood: DOC PS 1.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWWPA U1; Use Category UC3b.
1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent respectively.
 2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 3. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
 4. Do not use material that is warped or does not comply with requirements for untreated material.
 5. Mark lumber with treatment-quality mark of an inspection agency approved by the American Lumber Standard Committee's Board of Review.
 - a. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
 6. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
 - a. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.
 7. Application: All exterior lumber and plywood.

2.3 EXTERIOR TRIM

- A. Lumber Trim for Opaque-Stained or Painted Finish:
1. Species and Grade: Eastern white pine, eastern hemlock-balsam fir-tamarack, eastern spruce, or white woods; Finish or 1 Common (Colonial); NeLMA, NLGA, WCLIB, or WWPA.
 2. Maximum Moisture Content: 19 percent with at least 85 percent of shipment at 12 percent or less.
 3. Finger Jointing: Not allowed.
 4. Face Surface: Surfaced (smooth).
 5. Factory Priming: Factory coated on faces and edges with exterior primer compatible with topcoats specified.

- B. Moldings for Opaque-Stained or Painted Finish: WMMPA WM 4, P-grade wood moldings. Made from kiln-dried stock to patterns included in WMMPA WM 12.
 - 1. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine.
 - 2. Finger Jointing: Not allowed.
 - 3. Factory Priming: Factory coated on faces and edges with exterior primer compatible with topcoats specified.
 - 4. Molding Patterns: As shown on the Drawings.

2.4 LUMBER SIDING

- A. Re-use existing siding. Any replacement materials shall match existing in quality, species, size and profile.
- B. Verify local availability before retaining species and grade.

2.5 MISCELLANEOUS MATERIALS

- A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches into wood substrate.
 - 1. For face-fastening siding, provide stainless steel ringed-shank siding nails unless otherwise indicated.
 - 2. For pressure-preservative-treated wood, provide stainless-steel fasteners.
 - 3. For applications not otherwise indicated, provide stainless-steel fasteners.
- B. Wood Glue: Waterproof resorcinol glue recommended by manufacturer for exterior carpentry use.
- C. Flashing: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim" for flashing materials installed in exterior finish carpentry.
- D. Insect Screening for Soffit Vents: Stainless steel, 18-by-18-inch mesh.
- E. Continuous Soffit Vents: Aluminum hat channel shape with perforations, 2 inches wide and in lengths not less than 96 inches.
 - 1. Net Free Area: As indicated on Drawings.
 - 2. Finish: Painted to match soffits.
- F. Sealants: Latex, complying with ASTM C 834 Type OP, Grade NF and with applicable requirements in Section 079200 "Joint Sealants," recommended by sealant manufacturer and manufacturer of substrates for intended application.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Building Systems; Sonolac.
 - b. Bostik, Inc.; Chem-Calk 600.
 - c. May National Associates, Inc.; Bondaflex 600.
 - d. Pecora Corporation; AC-20+.
 - e. Schnee-Morehead, Inc., an ITW company; SM 8200.
 - f. Tremco Incorporated; Tremflex 834.
 - g. Or Approved Equal.

2.6 FABRICATION

- A. Back out or kerf backs of standing and running trim wider than 5 inches, except members with ends exposed in finished work.
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Prime lumber and moldings to be painted, including both faces and edges, unless factory primed. Cut to required lengths and prime ends. Comply with requirements in Section 099113 "Exterior Painting."

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
 - 1. Do not use manufactured units with defective surfaces, sizes, or patterns.
- B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut exterior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
 - 3. Install stairs with no more than 3/16-inch variation between adjacent treads and risers and with no more than 3/8-inch variation between largest and smallest treads and risers within each flight.
 - 4. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install flat-grain lumber with bark side exposed to weather.

- B. Install trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long except where necessary.
 - 1. Use scarf joints for end-to-end joints.
 - 2. Stagger end joints in adjacent and related members.
- C. Fit exterior joints to exclude water. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.
- D. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

3.5 SIDING INSTALLATION

- A. Install siding to comply with manufacturer's written instructions and warranty requirements.
- B. Flashing: Install metal flashing as indicated on Drawings and as recommended by siding manufacturer.
- C. Finish: Shall be applied as part of manufacturing process.

3.6 ADJUSTING

- A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.7 CLEANING

- A. Clean exterior finish carpentry on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.8 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062013

SECTION 062023 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior trim, including non-fire-rated interior door and sidelight frames.
 - 2. Shelving and clothes rods.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view and for framing exposed to view.
 - 2. Section 061053 "Miscellaneous Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
 - 3. Section 099123 "Interior Painting" for priming and backpriming of interior finish carpentry.

1.3 DEFINITIONS

- A. MDF: Medium-density fiberboard.
- B. MDO: Plywood with a medium-density overlay on the face.
- C. PVC: Polyvinyl chloride.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
 - 1. Include data for wood-preserved treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.
- B. Samples: For each exposed product and for each color and texture specified.
- C. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.

D. Samples for Verification:

1. For each species and cut of lumber and panel products with nonfactory-applied finish, with half of exposed surface finished; 50 sq. in. for lumber and 8 by 10 inches for panels.
2. For each finish system and color of lumber and panel products with factory-applied finish, 50 sq. in. for lumber and 8 by 10 inches for panels.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation.
1. Protect materials from weather by covering with waterproof sheeting, securely anchored.
 2. Provide for air circulation around stacks and under coverings.
- B. Deliver interior finish carpentry materials only when environmental conditions comply with requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet-work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's (ALSC) Board of Review. Grade lumber by an agency certified by the ALSC's Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.
- B. Softwood Plywood: DOC PS 1.
- C. Hardboard: ANSI A135.4.

D. MDF: ANSI A208.2, Grade 130.

E. Particleboard: ANSI A208.1, Grade M-2.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWWPA U1; Use Category UC1.

1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent, respectively.
2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
3. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
4. Do not use material that is warped or does not comply with requirements for untreated material.
5. Mark lumber with treatment-quality mark of an inspection agency approved by the ALSC's Board of Review.
6. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
7. Application: Where indicated on Drawings.

2.3 INTERIOR TRIM

A. Lumber Trim for Opaque Finish (Painted Finish):

1. Species and Grade:
 - a. Eastern white pine; NeLMA or NLGA D Select.
 - b. Idaho white, lodgepole, ponderosa, radiata, or sugar pine; NLGA or WWPA D Select (Quality).
 - c. Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine; NeLMA, NLGA, or WWPA D Select (Quality).
 - d. White woods; WWPA D Select.
 - e. Douglas fir-larch or Douglas fir south; NLGA, WCLIB, or WWPA Superior or C & Btr finish.
 - f. Spruce-pine-fir; NeLMA, NLGA, WCLIB, or WWPA 1 Common.
2. Maximum Moisture Content for Softwoods: 15 percent with at least 85 percent of shipment at 12 percent or less.
3. Maximum Moisture Content for Hardwoods: 10 percent.
4. Finger Jointing: Not allowed.
5. Face Surface: Surfaced (smooth).
6. Optional Material: Primed MDF of same actual dimensions as lumber indicated may be used in lieu of lumber.

B. Moldings for Opaque Finish (Painted Finish): Made to patterns included in MMPA's "WM/Series Softwood Moulding Patterns."

1. Softwood Moldings: MMPA WM 4, P grade.
 - a. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine.

- b. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
2. Hardwood Moldings: MMPA WM 4, P-grade.
 - a. Species: Aspen, basswood, cottonwood, gum, magnolia, soft maple, tupelo, or yellow poplar.
 - b. Maximum Moisture Content: 9 percent.
3. Finger Jointing: Not allowed.
4. Base Pattern: As shown on the drawings.
5. Shoe-Mold Pattern: As shown on the drawings.
6. Casing Pattern: As shown on the drawings.
7. Mull-Casing Pattern: As shown on the drawing.
8. Stop Pattern: As shown on the drawings or as provided by door buck manufacturer.

2.4 SHELVING AND CLOTHES RODS

- A. Closet Shelving: Made from one of the following materials, 3/4 inch thick:
 1. Particleboard with solid-wood front edge.
 2. MDO softwood plywood with solid-wood edge.
 3. Wood boards as specified above for lumber trim for opaque finish.
 4. Softwood Boards:
 - a. Kiln-dried eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine; NeLMA, NLGA, or WWPA C Select (Choice).
 - b. Kiln-dried Douglas fir-larch, Douglas fir south, or hem-fir; SPIB Superior or C & Btr finish; NLGA, WCLIB, or WWPA; or southern pine; B & B finish.
- B. Shelf Cleats: 3/4-by-3-1/2-inch boards, as specified above for shelving.
- C. Shelf Brackets with Rod Support: BHMA A156.16, B04051; prime-painted formed steel.
- D. Standards for Adjustable Shelf Brackets: BHMA A156.9, B04102; powder-coat-finished steel.
- E. Adjustable Shelf Brackets: BHMA A156.9, B04112; powder-coat-finished steel.
- F. Metal Clothes Rods: 1-5/16-inch-diameter, aluminum tubes.

2.5 MISCELLANEOUS MATERIALS

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
- B. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
- C. Multipurpose Construction Adhesive: Formulation, complying with ASTM D3498, that is recommended for indicated use by adhesive manufacturer.

2.6 FABRICATION

- A. Back out or kerf backs of the following members, except those with ends exposed in finished work:
 - 1. Interior standing and running trim, except shoe and crown molds.
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.
- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials.
 - 1. Use concealed shims where necessary for alignment.
 - 2. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 3. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
 - 4. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
 - 5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 INSTALLATION OF STANDING AND RUNNING TRIM

- A. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available.
 - 1. Do not use pieces less than 24 inches long, except where necessary.
 - 2. Stagger joints in adjacent and related standing and running trim.
 - 3. Cope at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint.
 - 4. Use scarf joints for end-to-end joints.
 - 5. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
 - 6. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
 - 7. Install trim after gypsum-board joint finishing operations are completed.
 - 8. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting.
 - 9. Fasten to prevent movement or warping.
 - 10. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 INSTALLATION OF SHELVING AND CLOTHES RODS

- A. Cut shelf cleats at ends of shelves about 1/2 inch less than width of shelves and sand exposed ends smooth.
 - 1. Install shelf cleats by fastening to framing or backing with finish nails or trim screws, set below face and filled.
 - 2. Space fasteners not more than 16 inches o.c. Use two fasteners at each framing member or fastener location for cleats 4 inches nominal in width and wider.
 - 3. Apply a bead of multipurpose construction adhesive to back of shelf cleats before installing.
 - 4. Remove adhesive that is squeezed out after fastening shelf cleats in place.
- B. Install shelf brackets according to manufacturer's written instructions, spaced not more than 32 inches o.c. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
- C. Install standards for adjustable shelf supports according to manufacturer's written instructions. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Space fasteners not more than 12 inches o.c.
- D. Install standards for adjustable shelf brackets according to manufacturer's written instructions, spaced not more than 36 inches o.c. and within 6 inches of ends of shelves. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
- E. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled.
 - 1. Install shelves, fully seated on cleats, brackets, and supports.
 - 2. Fasten shelves to cleats with finish nails or trim screws, set flush.
 - 3. Fasten shelves to brackets to comply with bracket manufacturer's written instructions.
- F. Install rod flanges for rods as indicated.

1. Fasten to shelf cleats, framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.
2. Install rods in rod flanges.

3.6 ADJUSTING

- A. Replace interior finish carpentry that is damaged or does not comply with requirements.
 1. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.
- B. Adjust joinery for uniform appearance.

3.7 CLEANING

- A. Clean interior finish carpentry on exposed and semiexposed surfaces.
- B. Restore damaged or soiled areas and touch up factory-applied finishes if any.

3.8 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062023

SECTION 064113 - WOOD-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Installation of Architectural wood cabinets.
 - 2. Wood furring, blocking, shims, and hanging strips for installing architectural wood cabinets unless concealed within other construction before cabinet installation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product panel products cabinet hardware and accessories and finishing materials and processes.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
 - 1. Show details full size.
 - 2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - 3. Show locations and sizes of cutouts and holes for electrical switches and outlets and other items installed in architectural wood cabinets.
 - 4. Show door leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
 - 5. Apply WI Certified Compliance Program label to Shop Drawings.
- C. Samples for Initial Selection:
 - 1. Shop-applied transparent finishes.
 - 2. PVC edge material.
 - 3. Thermoset decorative panels.
- D. Samples for Verification:
 - 1. Lumber for transparent finish, not less than 5 inches wide by 12 inches long, for each species and cut, finished on one side and one edge.
 - 2. Door leaves representative of and selected from flitches to be used for transparent-finished cabinets.
 - 3. Thermoset decorative panels, 8 by 10 inches, for each color, pattern, and surface finish, with edge banding on one edge.
 - 4. Corner pieces as follows:

- a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
 - b. Miter joints for standing trim.
5. Exposed cabinet hardware and accessories, one unit for each type and finish.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Certificates: For each type of product.
- C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.
- B. Installer Qualifications: Certified participant in AWI's Quality Certification Program.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver cabinets until painting and similar operations that could damage woodwork have been completed in installation areas. If cabinets must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed, and indicate measurements on Shop Drawings.
- C. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that wood-faced architectural cabinets can be supported and installed as indicated.
- B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Section 087111 "Door Hardware (Descriptive Specification)" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL CABINET FABRICATORS / ARCHITECTURAL WOOD CABINETS

- A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of architectural wood cabinets with sequence-matched wood doors with wood grain patterns that are sequence matched with woodwork and transparent-finished wood doors that are required to be of same species as woodwork.

2.2 ARCHITECTURAL WOOD CABINETS, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural wood cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. Provide labels and certificates from AWI certification program indicating that woodwork, including installation, complies with requirements of grades specified.
 - 2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

2.3 MANUFACTURERS

- A. Acceptable Manufacturers: Cabinets shall be of all plywood construction (box). Acceptable manufacturers:
 - 1. Bertch Legacy;
 - 2. Kraftmaid Cabinets; or
 - 3. Equal, when approved in advance by the Architect.

2.4 WOOD CABINETS FOR TRANSPARENT FINISH

- A. Grade: Premium.
- B. Type of Construction: Face frame.
- C. Cabinet and Door and Drawer Front Interface Style: Full overlay.
- D. Reveal Dimension: 1/2 inch.

- E. Wood for Exposed Surfaces:
1. Species: Cherry.
 2. Cut: Plain sliced/plain sawn.
 3. Grain Direction: Vertically for doors and fixed panels, horizontally for drawer fronts.
 4. Matching of Door Leaves: Book match.
 5. Door Leaves Matching within Panel Face: Running match.
 6. Comply with door grain pattern and other matching requirements indicated for blueprint-matched paneling.
- F. Semiexposed Surfaces: Provide surface materials indicated below:
1. Surfaces Other Than Drawer Bodies: Same species and cut indicated for exposed surfaces.
 2. Drawer Subfronts, Backs, and Sides: Solid-hardwood lumber, same species indicated for exposed surfaces.
 3. Drawer Bottoms: Hardwood plywood.
- G. Dust Panels: 1/4-inch plywood or tempered hardboard above compartments and drawers unless located directly under tops.
- H. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners.

2.5 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
 2. Wood Moisture Content: 5 to 10 percent.
 3. Softwood Plywood: DOC PS 1.
 4. Wood-based Panels: HPVA HP-1.

2.6 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087111 "Door Hardware (Descriptive Specification)."
- B. Butt Hinges: 2-3/4-inch, five-knuckle steel hinges made from 0.095-inch-thick metal, and as follows:
1. Semic concealed Hinges for Overlay Doors: BHMA A156.9, B01521.
- C. Back-Mounted Pulls: BHMA A156.9, B02011.
- D. Catches: Magnetic catches, BHMA A156.9, B03141.
- E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081.
- F. Shelf Rests: BHMA A156.9, B04013; metal.

- G. Drawer Slides: BHMA A156.9.
 - 1. Grade 1 and Grade 2: Side mounted and extending under bottom edge of drawer; full-extension type; zinc-plated steel with polymer rollers.
 - 2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
 - 3. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 2.
- H. Door Locks: BHMA A156.11, E07121.
- I. Drawer Locks: BHMA A156.11, E07041.
- J. Door and Drawer Silencers: BHMA A156.16, L03011.
- K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Dark, Oxidized, Satin Bronze, Oil Rubbed: BHMA 613 for bronze base; BHMA 640 for steel base; match Architect's sample.
- L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.7 FABRICATION

- A. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Corners of Cabinets: 1/16 inch unless otherwise indicated.
- B. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 - 1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
 - 2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

2.8 SHOP FINISHING

- A. General: Finish architectural wood cabinets at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

- B. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish: System - 12, water-based polyurethane.
 - 3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to cabinets made from closed-grain wood before staining and finishing.
 - 4. Staining: Match Architect's sample.
 - 5. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

2.9 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.
- D. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.
- B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Assemble cabinets and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.

1. For shop finished items use filler matching finish of items being installed.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 2. Maintain door pattern sequence matching of cabinets with transparent finish.
 3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.
- G. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.
1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are applied in shop.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean cabinets on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064113

SECTION 064600 - WOOD TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior standing and running trim.
2. Interior standing and running trim.
3. Closet and utility shelving.
4. Wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.
5. Shop priming of wood trim.
6. Shop finishing of wood trim.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, blocking, and shims required for installing wood trim and concealed within other construction before wood trim installation.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including finishing materials and processes.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show details full size.
2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
3. Apply WI Certified Compliance Program label to Shop Drawings.
4. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples for Initial Selection:

1. Shop-applied transparent finishes.
2. Shop-applied opaque finishes.

D. Samples for Verification:

1. Lumber for transparent finish, not less than 5 inches wide by 12 inches long, for each species and cut, finished on one side and one edge.

2. Lumber and panel products with shop-applied opaque finish, 5 inches wide by 12 inches long for lumber and 8 by 10 inches for panels, for each finish system and color, with one-half of exposed surface finished.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of product.
- C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.
- D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.
- B. Installer Qualifications: Fabricator of products.
- C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.
- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Build mockups of typical wood trim as shown on Drawings.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver wood trim until operations that could damage wood trim have been completed in installation areas. If wood trim must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

- A. Weather Limitations for Exterior Work: Proceed with installation of exterior wood trim only when existing and forecasted weather conditions permit work to be performed and at least one coat of specified finish to be applied without exposure to rain, snow, or dampness.
- B. Environmental Limitations for Interior Work: Do not deliver or install interior wood trim until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

- C. Environmental Limitations for Interior Work: Do not deliver or install interior wood trim until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

1.8 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that wood trim can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 WOOD TRIM, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of wood trim indicated for construction, finishes, installation, and other requirements.
 - 1. Provide labels and certificates from AWI certification program indicating that woodwork, including installation, complies with requirements of grades specified.
 - 2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

2.2 EXTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

- A. Grade: Premium.
- B. Regional Materials: Exterior trim for transparent finish shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- C. Certified Wood: Exterior trim for transparent finish shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and FSC STD-40-004, "FSC Standard for Chain of Custody Certification."
- D. Wood Species: Ponderosa pine or sugar pine, Eastern white pine, or to match existing.

2.3 EXTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH

- A. Grade: Premium.
- B. Regional Materials: Exterior trim for opaque finish shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- C. Certified Wood: Exterior trim for opaque finish shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and FSC STD-40-004, "FSC Standard for Chain of Custody Certification."

- D. Wood Species: Eastern white pine, sugar pine, or western white pine or matching existin.

2.4 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

- A. Grade: Premium.
- B. Regional Materials: Interior trim for transparent finish shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- C. Regional Materials: Interior trim for transparent finish shall be manufactured within 500 miles of Project site.
- D. Certified Wood: Interior trim for transparent finish shall be certified as "FSC Pure" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and FSC STD-40-004, "FSC Standard for Chain of Custody Certification."
- E. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated.
 - 1. Species: White oak.
 - 2. Cut: Plain sliced/plain sawn.
 - 3. Provide split species on trim that faces areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.
- F. For trim items other than base wider than available lumber, use veneered construction. Do not glue for width.
- G. For base wider than available lumber, glue for width. Do not use veneered construction.
- H. For rails thicker than available lumber, use veneered construction. Do not glue for thickness.

2.5 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH

- A. Grade: Premium.
- B. Regional Materials: Interior trim for opaque finish shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- C. Regional Materials: Interior trim for opaque finish shall be manufactured within 500 miles of Project site.
- D. Certified Wood: Interior trim for opaque finish shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and FSC STD-40-004, "FSC Standard for Chain of Custody Certification."
- E. Wood Species: Eastern white pine, sugar pine, or western white pine.

2.6 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of wood trim and quality grade specified unless otherwise indicated.
1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
 2. Wood Moisture Content for Exterior Materials: 9 to 15 percent.
 3. Wood Moisture Content for Interior Materials: 5 to 10 percent.

2.7 MISCELLANEOUS MATERIALS

- A. Exterior Blocking, Shims, and Nailers: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
1. Preservative Treatment by Pressure Process: AWWPA U1; Use Category UC3b.
 - a. Kiln dry lumber after treatment to a maximum moisture content of 19 percent.
 - b. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - c. Mark lumber with treatment quality mark of an inspection agency approved by the American Lumber Standards Committee's (ALSC) Board of Review.
- B. Interior Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- C. Nails for Exterior Use: stainless steel.
- D. Screws for Exterior Use: bronze or stainless steel.
- E. Provide self-drilling screws for metal-framing supports, as recommended by metal-framing manufacturer.
- F. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- G. Adhesives: Do not use adhesives that contain urea formaldehyde.
- H. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- I. VOC Limits for Installation Adhesives and Sealants: Use products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Wood Glues: 30 g/L.
 2. Multipurpose Construction Adhesives: 70 g/L.
 3. Structural Wood Member Adhesive: 140 g/L.
 4. Architectural Sealants: 250 g/L.

2.8 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Fabricate wood trim to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
 - 1. Edges of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.
 - 2. Edges of Rails and Similar Members More Than 3/4 Inch Thick: 1/8 inch.
- C. Backout or groove backs of flat trim members and kerf backs of other wide, flat members except for members with ends exposed in finished work.
- D. Assemble casings in shop except where shipping limitations require field assembly.
- E. Assemble moldings in shop to maximum extent possible. Miter corners in shop and prepare for field assembly with bolted fittings designed to pull connections together.

2.9 SHOP PRIMING

- A. Exterior Wood Trim for Opaque Finish: Shop prime with one coat of wood primer specified in Section 099113 "Exterior Painting."
- B. Exterior Wood Trim for Transparent Finish: Shop seal with stain (if required), other required pretreatments, and first coat of finish as specified in Section 099300 "Staining and Transparent Finishing."
- C. Interior Wood Trim for Opaque Finish: Shop prime with one coat of wood primer specified in Section 099123 "Interior Painting."
- D. Interior Wood Trim for Transparent Finish: Shop seal with stain (if required), other required pretreatments, and first coat of finish as specified in Section 099300 "Staining and Transparent Finishing."
- E. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing wood trim, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of wood trim. Apply two coats to surfaces installed in contact with concrete or masonry and to end-grain surfaces.

2.10 SHOP FINISHING

- A. General: Finish wood trim at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. General: Shop finish transparent-finished wood trim at fabrication shop as specified in this Section. Refer to Section 090391 "Historic Treatment of Plain Painting" for field finishing opaque-finished wood trim.

- C. General: Drawings indicate items that are required to be shop finished. Finish such items at fabrication shop as specified in this Section. Refer to Section 090391 "Historic Treatment of Plain Painting" for field finishing wood trim not indicated to be shop finished.
- D. Finish Materials: Use finish materials that meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing wood trim, as applicable to each unit of work.
 - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of wood trim. Apply two coats to end-grain surfaces.
- F. Transparent Finish for Exterior Trim: Comply with Section 099300 "Staining and Transparent Finishing."
- G. Opaque Finish for Exterior Trim: Comply with Section 099113 "Exterior Painting."
- H. Opaque Finish for Interior Trim:
 - 1. Grade: Same as item to be finished.
 - 2. Finish: System - 4, water-based latex acrylic.
 - 3. Color: As selected by Architect from manufacturer's full range.
 - 4. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition wood trim to average prevailing humidity conditions in installation areas.
- B. Before installing architectural wood trim, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

- A. Grade: Install wood trim to comply with same grade as item to be installed.
- B. Assemble wood trim and complete fabrication at Project site to the extent that it was not completed in the shop.
- C. Install wood trim level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- D. Scribe and cut wood trim to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

- F. Preservative-Treated Wood: Where cut or drilled in field, treat cut ends and drilled holes according to AWPA M4.
- G. Anchor wood trim to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
 - 1. For shop-finished items, use filler matching finish of items being installed.
- H. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 60 inches long except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.
 - 1. Fill gaps, if any, between top of base and wall with plastic wood filler; sand smooth; and finish same as wood base if finished.
 - 2. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.
 - 3. Install wall railings on indicated metal brackets securely fastened to wall framing.
- I. Touch up finishing work specified in this Section after installation of wood trim. Fill nail holes with matching filler where exposed.
 - 1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are applied in shop.

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective wood trim, where possible, to eliminate functional and visual defects; where not possible to repair, replace wood trim. Adjust joinery for uniform appearance.
- B. Clean wood trim on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064600

SECTION 071113 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Cold-applied, cut-back-asphalt dampproofing.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for bituminous vapor retarders.
 - 2. Section 042200 "Concrete Unit Masonry" for mortar parge coat on masonry surfaces.
 - 3. Section 071416 "Cold Fluid-Applied Waterproofing" for waterproofing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 FIELD CONDITIONS

- A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.
- B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide molded-sheet drainage panels and auxiliary materials recommended in writing by manufacturer of primary materials.
- B. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise required.

2.2 COLD-APPLIED, CUT-BACK-ASPHALT DAMPPROOFING

- A. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. [APOC, Inc.](#); a division of Gardner-Gibson.
 2. [BASF Construction Chemicals - Building Systems](#); Sonneborn Brand Products.
 3. [Brewer Company \(The\)](#).
 4. [ChemMasters, Inc.](#)
 5. [Euclid Chemical Company \(The\)](#); an RPM company.
 6. [Henry Company](#).
 7. [Karnak Corporation](#).
 8. [Koppers Inc.](#)
 9. [Malarkey Roofing Products](#).
 10. [Meadows, W. R., Inc.](#); or
 11. Approved Equal.
- B. Trowel Coats: ASTM D 4586, Type I, Class 1, fibered.
- C. Brush and Spray Coats: ASTM D 4479, Type I, fibered.
- D. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. Low-Emitting Materials: Dampproofing shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
- B. Cut-Back-Asphalt Primer: ASTM D 41.
- C. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.
1. Primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.
- E. Patching Compound: Epoxy or latex-modified repair mortar of type recommended in writing by dampproofing manufacturer.
- F. Protection Course: ASTM D 6506, 1/8-inch-thick, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners.
- G. Protection Course: Fan folded, with a core of extruded-polystyrene board insulation faced on both sides with plastic film, nominal thickness 1/4 inch, with a compressive strength of not less than 8 psi per ASTM D 1621, and maximum water absorption by volume of 0.6 percent per ASTM C 272.

- H. Protection Course: Extruded-polystyrene board insulation, unfaced, ASTM C 578, Type X, 1/2 inch thick.
- I. Protection Course: Smooth-surfaced roll roofing complying with ASTM D 6380, Class S, Type III.

2.4 MOLDED-SHEET DRAINAGE PANELS

- A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side of the core; and with a vertical flow rate of 9 to 15 gpm per ft..
 - 1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. [American Hydrotech, Inc.](#)
 - b. [Carlisle Coatings & Waterproofing Inc.](#)
 - c. [Grace, W. R., & Co. - Conn.](#)
 - d. [Protecto Wrap Company.](#)
 - e. Or, Approved Equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous dampproofing work.
 - 1. Test for surface moisture according to ASTM D 4263.
- B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- B. Clean substrates of projections and substances detrimental to the dampproofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.
- C. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections.

3.3 APPLICATION, GENERAL

- A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.
 - 1. Apply dampproofing to provide continuous plane of protection.
 - 2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.

- B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.
 - 1. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 - 2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch-wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.
- C. Where dampproofing exterior face of inner wythe of exterior masonry cavity walls, lap dampproofing at least 1/4 inch onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
 - 1. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe.
 - 2. Lap dampproofing at least 1/4 inch onto shelf angles supporting veneer.
- D. Where dampproofing interior face of above-grade, exterior concrete and masonry walls, continue dampproofing through intersecting walls by keeping vertical mortar joints at intersection temporarily open or by dampproofing wall before constructing intersecting walls.

3.4 COLD-APPLIED, CUT-BACK-ASPHALT DAMPPROOFING

- A. Concrete Foundations and Parged Masonry Foundation Walls: Apply two brush or spray coats at not less than 1.25 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat.

3.5 INSTALLATION OF PROTECTION COURSE

- A. Where indicated, install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.
 - 1. Support protection course over cured coating with spot application of adhesive type recommended in writing by protection-board manufacturer.
 - 2. Install protection course on same day of installation of dampproofing (while coating is tacky) to ensure adhesion.

3.6 INSTALLATION OF MOLDED-SHEET DRAINAGE PANELS

- A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall substrate, according to manufacturer's written instructions. Use adhesives or other methods that do not penetrate dampproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.
 - 1. Install protection course before installing drainage panels.

3.7 CLEANING

- A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

BITUMINOUS DAMPPROOFING

Restoration and Expansion
Historic Metlar-Bodine House
Piscataway, Middlesex County, NJ
Architects Project No.: 1836C

END OF SECTION 071113

SECTION 071416 - COLD FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Polyester waterproofing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
 - 2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.
- B. Shop Drawings:
 - 1. Show locations and extent of waterproofing.
 - 2. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
 - 3. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal-supported concrete pavers.
- C. Samples: For each exposed product and for each color and texture specified, including the following products:
 - 1. Flashing sheet, 8 by 8 inches.
 - 2. Membrane-reinforcing fabric, 8 by 8 inches.
 - 3. Insulation, 8 by 8 inches.
 - 4. Drainage panel, 4 by 4 inches.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Field quality-control reports.
- C. Sample Warranties: For special warranties.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer.
 - 1. Do not apply waterproofing to a damp or wet substrate, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.
 - 2. Do not apply waterproofing in snow, rain, fog or mist, or when such weather conditions are imminent during application and curing period.
- B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.6 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace waterproofing that fails in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Source Limitations for Waterproofing System: Obtain waterproofing materials, protection course, and molded-sheet drainage panels from single source from single manufacturer.

2.2 POLYESTER WATERPROOFING

- A. Multicomponent, Reinforced, Unsaturated Polyester Waterproofing: ASTM C 836/C 836M.
 - 1. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. **Kemper System, Inc;** Kemperol BR;
 - b. Henry Company, Henry CM 100;
 - c. Carlisle Coatings and Waterproofing; or
 - d. Or Approved Equal

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials recommended in writing by waterproofing manufacturer for intended use and compatible with one another and with waterproofing.
 - 1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
- B. Primer: Manufacturer's standard primer, sealer, or surface conditioner; factory-formulated acrylic latex, polyurethane, or epoxy.
- C. Sheet Flashing: 50-mil-minimum, nonstaining, uncured sheet neoprene.
 - 1. Adhesive: Manufacturer's recommended contact adhesive.

- D. Membrane-Reinforcing Fabric: Manufacturer's recommended fiberglass mesh or polyester fabric, manufacturer's standard weight.
- E. Joint Reinforcing Strip: Manufacturer's recommended fiberglass mesh or polyester fabric.
- F. Joint Sealant: Multicomponent polyurethane sealant, compatible with waterproofing; ASTM C 920, Type M, Class 25 or greater; Grade NS for sloping and vertical applications and Grade P for deck applications; Use NT exposure; and as recommended by manufacturer for substrate and joint conditions.
 - 1. Backer Rod: Closed-cell polyethylene foam.

2.4 PROTECTION COURSE

- A. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:
 - 1. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. [Henry Company](#); Asphalt Protection Board.
 - b. [Soprema, Inc](#); Sopraboard.
 - c. [W. R. Meadows, Inc](#); Protection Course; or.
 - d. Or Approved Equal
 - 2. Thickness: 1/8 inch, nominal.
 - 3. Thickness: 1/8 inch, nominal, for vertical applications; 1/4 inch, nominal, elsewhere.
 - 4. Adhesive: Rubber-based solvent type recommended in writing by waterproofing manufacturer.

2.5 MOLDED-SHEET DRAINAGE PANELS

- A. Molded-Sheet Drainage Panel: Comply with Section 334600 "Subdrainage."

2.6 INSULATION

- A. Board Insulation: Extruded-polystyrene board insulation according to ASTM C 578, square or shiplap edged.
 - 1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. [DiversiFoam Products](#).
 - b. [Dow Chemical Company \(The\)](#).
 - c. [Owens Corning](#).
 - d. [Pactiv Corporation](#).
 - e. [T. Clear Corporation](#); or
 - f. Or Approved Equal.
 - 2. Type VI, 40-psi minimum compressive strength.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
 - 2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, acid residues, and other penetrating contaminants or film-forming coatings from concrete.
 - 1. Abrasive blast clean concrete surfaces uniformly to expose top surface of fine aggregate according to ASTM D 4259 with a self-contained, recirculating, blast-cleaning apparatus. Remove material to provide a sound surface free of laitance, glaze, efflorescence, curing compounds, concrete hardeners, or form-release agents. Remove remaining loose material and clean surfaces according to ASTM D 4258.
- D. Remove fins, ridges, and other projections, and fill honeycomb, aggregate pockets, holes, and other voids.

3.3 PREPARATION AT TERMINATIONS, PENETRATIONS, AND CORNERS

- A. Prepare surfaces at terminations and penetrations through waterproofing and at expansion joints, drains, sleeves, and corners according to waterproofing manufacturer's written instructions and to recommendations in ASTM C 898/C 898M and ASTM C 1471.
- B. Apply waterproofing in two separate applications, and embed a joint reinforcing strip in the first preparation coat when recommended by waterproofing manufacturer.

3.4 JOINT AND CRACK TREATMENT

- A. Prepare, treat, rout, and fill joints and cracks in substrate according to waterproofing manufacturer's written instructions and to recommendations in ASTM C 898/C 898M and ASTM C 1471. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.
 - 1. Comply with ASTM C 1193 for joint-sealant installation.
 - 2. Apply bond breaker on sealant surface, beneath preparation strip.
 - 3. Prime substrate along each side of joint and apply a single thickness of preparation strip at least 6 inches (150 mm) wide along each side of joint. Apply waterproofing in two separate applications and embed a joint reinforcing strip in the first preparation coat.
- B. Install sheet flashing and bond to deck and wall substrates where required according to waterproofing manufacturer's written instructions.
 - 1. Extend sheet flashings for 4 inches (100 mm) onto perpendicular surfaces and items penetrating substrate.

3.5 WATERPROOFING APPLICATION

- A. Apply waterproofing according to manufacturer's written instructions and to recommendations in ASTM C 898/C 898M and ASTM C 1471.
- B. Start installing waterproofing in presence of manufacturer's technical representative.
- C. Apply primer over prepared substrate unless otherwise instructed in writing by waterproofing manufacturer.
- D. Unreinforced Waterproofing Applications: Mix materials and apply waterproofing by spray, roller, notched squeegee, trowel, or other application method suitable to slope of substrate.
 - 1. Apply one or more coats of waterproofing to obtain a seamless membrane free of entrapped gases and pinholes, with a dry film thickness of 60 mils (1.5 mm).
 - 2. Apply waterproofing to prepared wall terminations and vertical surfaces.
 - 3. Verify manufacturer's recommended wet film thickness of waterproofing every 100 sq. ft. (9.3 sq. m).
- E. Reinforced Waterproofing Applications: Mix materials and apply waterproofing by roller, notched squeegee, trowel, or other suitable application method.
 - 1. Apply first coat of waterproofing, embed membrane-reinforcing fabric, and apply second coat of waterproofing to completely saturate reinforcing fabric and to obtain a seamless reinforced membrane free of entrapped gases and pinholes, with an average dry film total thickness of 70 mils (1.8 mm).
 - 2. Apply reinforced waterproofing to prepared wall terminations and vertical surfaces.
 - 3. Verify manufacturer's recommended wet film thickness of waterproofing every 100 sq. ft. (9.3 sq. m).
- F. Cure waterproofing, taking care to prevent contamination and damage during application and curing.

- G. Install protection course with butted joints over waterproofing before starting subsequent construction operations.
 - 1. For horizontal applications, install protection course loose laid over fully cured membrane.
 - 2. For vertical applications, set protection course in nominally cured membrane, which will act as an adhesive. If membrane cures before application of protection course, use adhesive.
 - 3. Molded-sheet drainage panels may be used in place of a separate protection course for vertical applications when approved in writing by waterproofing manufacturer.

3.6 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

- A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesive or another method that does not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.
 - 1. For vertical applications, install protection course before installing drainage panels.
- B. Molded-Sheet Collector-Panel System: Install according to manufacturer's written instructions. Connect to piped subdrainage system specified in Section 334600 "Subdrainage."

3.7 INSULATION INSTALLATION

- A. Install one or more layers of board insulation to achieve required thickness over waterproofed surfaces. Cut and fit to within 3/4 inch (19 mm) of projections and penetrations.
- B. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions.
- C. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.8 INSULATION DRAINAGE PANEL INSTALLATION

- A. Install drainage panels over waterproofed surfaces. Cut and fit to within 3/4 inch (19 mm) of projections and penetrations.
- B. Ensure that drainage channels are aligned and free of obstructions.
- C. On vertical surfaces, set insulation drainage panels in adhesive or tape applied according to manufacturer's written instructions.
- D. On horizontal surfaces, loosely lay insulation drainage panels according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

END OF SECTION 071416

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Extruded polystyrene foam-plastic board.
2. Molded polystyrene foam-plastic board.
3. Polyisocyanurate foam-plastic board.
4. Glass-fiber blanket.
5. Glass-fiber board.
6. Spray-applied cellulosic insulation.
7. Cellular glass.

B. Related Requirements:

1. Section 042000 "Unit Masonry" for insulation installed in masonry cells.
2. Section 061600 "Sheathing" for foam-plastic board sheathing installed directly over wood or steel framing.
3. Section 072119 "Foamed-in-Place Insulation" for spray-applied polyurethane foam insulation.
4. Section 092900 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.

2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

- A. Refer to Drawings for type of insulation is appropriate for each application
- B. Extruded Polystyrene Board, Type VII: ASTM C578, Type VII, 60-psi minimum compressive strength; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E84.
 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Dow Chemical Company \(The\)](#).
 - b. [DuPont de Nemours, Inc.](#)
 - c. [Owens Corning](#).

2.2 MOLDED POLYSTYRENE FOAM-PLASTIC BOARD

- A. Refer to Drawings for type of insulation is appropriate for each application
- B. Molded Polystyrene Board, Type XV: ASTM C578, Type XV, 60-psi minimum compressive strength.
 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Atlas Roofing Corporation - Molded Polystyrene](#).
 - b. [Insulfoam; Carlisle Construction Materials Company](#).
 - c. [Plymouth Foam, Inc.](#)

2.3 POLYISOCYANURATE FOAM-PLASTIC BOARD

- A. Refer to Drawings for type of insulation is appropriate for each application
- B. Polyisocyanurate Board, Foil Faced: ASTM C1289, foil faced, Type I, Class 1 or 2.
 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Atlas Roofing Corporation - Molded Polystyrene](#).
 - b. [Carlisle Coatings & Waterproofing Inc; Carlisle Construction Materials](#).
 - c. [Dow Chemical Company \(The\)](#).
 - d. [Johns Manville; a Berkshire Hathaway company](#).
 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- C. Polyisocyanurate Board, Glass-Fiber-Mat Faced: ASTM C1289, glass-fiber-mat faced, Type II, Class 2.
 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Atlas Roofing Corporation - Polyiso](#).

- b. [Carlisle Coatings & Waterproofing Inc; Carlisle Construction Materials.](#)
 - c. [Johns Manville; a Berkshire Hathaway company.](#)
2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.4 GLASS-FIBER BLANKET

- A. Refer to Drawings for type of insulation is appropriate for each application.
- B. Glass-Fiber Blanket, Unfaced: ASTM C665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E84; passing ASTM E136 for combustion characteristics.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Certainteed; SAINT-GOBAIN.](#)
 - b. [Johns Manville; a Berkshire Hathaway company.](#)
 - c. [Owens Corning.](#)
- C. Glass-Fiber Blanket, Polypropylene-Scrim-Kraft Faced: ASTM C665, Type II (nonreflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier).
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Certainteed; SAINT-GOBAIN.](#)
 - b. [Johns Manville; a Berkshire Hathaway company.](#)
 - c. [Owens Corning.](#)
- D. Glass-Fiber Blanket, Kraft Faced: ASTM C665, Type II (nonreflective faced), Class C (faced surface not rated for flame propagation); Category 1 (membrane is a vapor barrier).
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Certainteed; SAINT-GOBAIN.](#)
 - b. [Johns Manville; a Berkshire Hathaway company.](#)
 - c. [Owens Corning.](#)
- E. Glass-Fiber Blanket, Reinforced-Foil Faced: ASTM C665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Certainteed; SAINT-GOBAIN.](#)
 - b. [Johns Manville; a Berkshire Hathaway company.](#)
 - c. [Owens Corning.](#)
- F. Glass-Fiber Blanket, Foil Faced: ASTM C665, Type III (reflective faced), Class B (faced surface with a flame-propagation resistance of 0.12 W/sq. cm); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Certainteed; SAINT-GOBAIN.](#)
 - b. [Johns Manville; a Berkshire Hathaway company.](#)
 - c. [Owens Corning.](#)

2.5 SPRAY-APPLIED CELLULOSIC INSULATION

- A. Self-Supported, Spray-Applied Cellulosic Insulation <Insert drawing designation>: ASTM C1149, Type I (materials applied with liquid adhesive; suitable for either exposed or enclosed applications), chemically treated for flame-resistance, processing, and handling characteristics.
 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Hamilton Manufacturing Inc.](#)
 - b. [International Cellulose Corp.](#)
 - c. [US Greenfiber LLC.](#)

2.6 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [AGM Industries, Inc.](#)
 - b. [Gemco.](#)
 2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.
- B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position with self-locking washer in place.
 1. **Manufacturers:** Subject to compliance with requirements, provide products by the following:
 - a. [Gemco.](#)
 2. Angle: Formed from 0.030-inch-thick, perforated, galvanized carbon-steel sheet with each leg 2 inches square.
 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation.
- C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [AGM Industries, Inc.](#)
 - b. [Gemco.](#)

2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
 - a. Crawl spaces.
 - b. Ceiling plenums.
 - c. Attic spaces.
- D. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 inch between face of insulation and substrate to which anchor is attached.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Gemco.
- E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates without damaging insulation, fasteners, or substrates.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AGM Industries, Inc.
 - b. Gemco.

2.7 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
 2. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.
- B. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.
- C. Asphalt Coating for Cellular-Glass Block Insulation: Cutback asphalt or asphalt emulsion of type recommended by manufacturer of cellular-glass block insulation.
- D. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF SLAB INSULATION

- A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches in from exterior walls.

3.4 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Anchor Installation: Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
 - 1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application.
 - 2. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
 - 3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation.
 - 4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
- C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

3.5 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face and as recommended by manufacturer.
1. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions, and with faces flush.
 2. Press units firmly against inside substrates.
 3. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 042000 "Unit Masonry."

3.6 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 4. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 5. For wood-framed construction, install blankets according to ASTM C1320 and as follows:
 - a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
 6. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
 - a. Exterior Walls: Set units with facing placed toward as indicated on Drawings.
 - b. Interior Walls: Set units with facing placed as indicated on Drawings.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..
 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.
- C. Spray-Applied Cellulosic Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.

THERMAL INSULATION

Restoration and Expansion
Historic Metlar-Bodine House
Piscataway, Middlesex County, NJ
Architects Project No.: 1836C

3.7 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 072119 - FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Closed-cell spray polyurethane foam.
- B. Related Requirements:
 - 1. Section 072100 "Thermal Insulation" for foam-plastic board insulation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Evaluation Reports: For spray-applied polyurethane foam-plastic insulation, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM

- A. Closed-Cell Spray Polyurethane Foam: ASTM C1029, Type II, minimum density of 1.5 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 6.2 deg F x h x sq. ft./Btu at 75 deg F.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlisle Spray Foam Insulation; Carlisle Construction Materials.
 - b. Henry Company.
 - c. Johns Manville; a Berkshire Hathaway company.
 - d. Volatile Free, Inc.

2. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 75 or less.
 - b. Smoke-Developed Index: 450 or less.
3. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.
- B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

3.2 INSTALLATION

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Spray insulation to envelop entire area to be insulated and fill voids.
- C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.
- D. Framed Construction: Install into cavities formed by framing members to achieve thickness indicated on Drawings.
- E. Cavity Walls: Install into cavities to [thickness indicated on Drawings] [fully fill void].
- F. Miscellaneous Voids: Apply according to manufacturer's written instructions.

3.3 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION 072119

SECTION 072500 - WEATHER BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Building paper.
 - 2. Building wrap.
 - 3. Flexible flashing.
 - 4. Drainage material.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.
- B. Shop Drawings: Show details of building paper wrap at terminations, openings, and penetrations. Show details of flexible flashing applications.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For water-resistive barrier, from ICC-ES.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

- A. Building Paper: ASTM D226, Type 1 (No. 15 asphalt-saturated organic felt), unperforated.
- B. Building Paper: Water-vapor-permeable, asphalt-saturated kraft building paper that complies with ICC-ES AC38, Grade D; except with water-resistance rating not less than 1 hour.
- C. Building Wrap: ASTM E1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E84; UV stabilized; and acceptable to authorities having jurisdiction.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Dow Chemical Company (The).
 - b. DuPont de Nemours, Inc.

- c. [Ludlow Coated Products.](#)
 - d. [TYPAR.](#)
 - 2. Water-Vapor Permeance: Not less than 75 perms per ASTM E96/E96M, Desiccant Method (Procedure A).
 - 3. Air Permeance: Not more than 0.004 cfm/sq. ft. at 0.3-inch wg when tested according to ASTM E2178.
 - 4. Allowable UV Exposure Time: Not less than three months.
 - 5. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.
- D. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 DRAINAGE MATERIAL

- A. Drainage Material: Product shall maintain a continuous open space between water-resistive barrier and exterior cladding to create a drainage plane and shall be used under siding.
- 1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:
 - a. [Advanced Building Products Inc.](#)
 - b. [DuPont de Nemours, Inc.](#)
 - c. [Keene Building Products.](#)
 - d. [Stuc-O-Flex International, Inc.](#)
 - e. [TYPAR.](#)
 - f. Or Approved Equal.
 - 2. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.
- B. Cover sheathing with water-resistive barrier as follows:
- 1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
 - 2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.
- C. Building Paper: Apply horizontally with a 2-inch overlap and a 6-inch end lap; fasten to sheathing with galvanized staples or roofing nails.
- D. Building Wrap: Comply with manufacturer's written instructions and warranty requirements.
- 1. Seal seams, edges, fasteners, and penetrations with tape.
 - 2. Extend into jambs of openings and seal corners with tape.

3.2 DRAINAGE MATERIAL INSTALLATION

- A. Install drainage material over building wrap and flashing to comply with manufacturer's written instructions.

END OF SECTION 072500

SECTION 073113 - ASPHALT SHINGLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Asphalt shingles.
 - 2. Underlayment.
 - 3. Metal flashing and trim.

1.3 DEFINITION

- A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.
 - 1. Asphalt Shingles: Full size.
 - 2. Ridge and Hip Cap Shingles: Full size.
 - 3. Exposed Valley Lining: 12 inches square.
- C. Samples for Initial Selection: For each type of asphalt shingle indicated.
 - 1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification: For the following products, of sizes indicated:
 - 1. Asphalt Shingles: Full size.
 - 2. Ridge and Hip Cap Shingles: Full size.
 - 3. Exposed Valley Lining: 12 inches square.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each type of asphalt shingle and underlayment product indicated, for tests performed by manufacturer and witnessed by a qualified testing agency.

- C. Evaluation Reports: For synthetic underlayment and high-temperature, self-adhering sheet underlayment, from ICC-ES or other testing and inspecting agency acceptable to authorities having jurisdiction, indicating that product is suitable for intended use under applicable building codes.
- D. Sample Warranty: For manufacturer's warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For asphalt shingles to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Asphalt Shingles: 100 sq. ft. of each type, in unbroken bundles.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing materials in a dry, well-ventilated location protected from weather, sunlight, and moisture according to manufacturer's written instructions.
- B. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.
- C. Protect unused roofing materials from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.
- D. Handle, store, and place roofing materials in a manner to prevent damage to roof deck or structural supporting members.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended in writing by manufacturer.

1.11 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Manufacturing defects.
 - 2. Material Warranty Period: 30 years from date of Substantial Completion, prorated, with first three years nonprorated.
 - 3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to 80 mph for five Insert number years from date of Substantial Completion.

4. Algae-Resistance Warranty Period: Asphalt shingles will not discolor for 10 years from date of Substantial Completion.
 5. Workmanship Warranty Period: Two years from date of Substantial Completion.
- B. Roofing Installer's Warranty: On warranty form at end of this Section, signed by Installer, in which Installer agrees to repair or replace components of asphalt-shingle roofing that fail in materials or workmanship within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance according to ASTM E 108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

2.2 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Laminated-Strip, SBS-Modified Asphalt Shingles: ASTM D 3462/D 3462M, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing; complying with UL 2218, Class 4.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Atlas EPS; a Division of Atlas Roofing Corporation.](#)
 - b. [CertainTeed Corporation.](#)
 - c. [Malarkey Roofing Company.](#)
 2. Butt Edge: Straight cut.
 3. Strip Size: Manufacturer's standard.
 4. Algae Resistance: Granules resist algae discoloration.
 5. Color and Blends: As selected by Architect from manufacturer's full range.
- B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.3 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D 226/D 226M, asphalt-saturated organic felts, nonperforated.
1. Type: Type I.
- B. Synthetic Underlayment: UV-resistant polypropylene, polyolefin, or polyethylene polymer fabric with surface coatings or treatments to improve traction underfoot and abrasion resistance; evaluated and documented to be suitable for use as a roof underlayment under applicable codes by a testing and inspecting agency acceptable to authorities having jurisdiction.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Atlas EPS; a Division of Atlas Roofing Corporation.](#)

- b. [CertainTeed Corporation.](#)
 - c. [GAF.](#)
- C. Self-Adhering Sheet Underlayment, High Temperature: Minimum of 40-mil-thick; with slip-resisting, polymer-film-reinforced or glass-reinforced top surface laminated to layer of butyl or SBS-modified asphalt adhesive; with release backing; cold applied; and evaluated and documented to be suitable for use for intended purpose under applicable codes by a testing and inspecting agency acceptable to authorities having jurisdiction.
- 1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:
 - a. [Atlas EPS; a Division of Atlas Roofing Corporation.](#)
 - b. [Carlisle Residential; a division of Carlisle Construction Materials.](#)
 - c. [Owens Corning.](#)
 - d. [Tamko Building Products, Inc.](#)
 - 2. Thermal Stability: Stable after testing at 240 deg F according to ASTM D 1970/D 1970M.
 - 3. Low-Temperature Flexibility: Passes after testing at minus 20 deg F according to ASTM D 1970/D 1970M.
- D. Granular-Surfaced Valley Lining: ASTM D 6380, Class M, organic-felt-based, asphalt roll roofing; 36 inches wide.

2.4 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.
- B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch-diameter, sharp-pointed, with a minimum 3/8-inch-diameter flat head and of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through OSB or plywood sheathing.
 - 1. Shank: Barbed.
 - 2. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- C. Felt-Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch minimum diameter.
- D. Synthetic-Underlayment Fasteners: As recommended in writing by synthetic-underlayment manufacturer for application indicated.

2.5 METAL FLASHING AND TRIM

- A. General: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
 - 1. Sheet Metal: Anodized aluminum.
- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.

1. Drip Edges: Fabricate in lengths not exceeding 10 feet with 2-inch roof-deck flange and 1-1/2-inch fascia flange with 3/8-inch drip at lower edge.
- C. Vent Pipe Flashings: ASTM B 749, Type L51121, at least 1/16 inch thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least 4 inches from pipe onto roof.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provisions have been made for flashings and penetrations through asphalt shingles.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
- B. Single-Layer Felt Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides a minimum of 2 inches over underlying course. Lap ends a minimum of 4 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with roofing nails.
1. Install felt underlayment on roof deck not covered by self-adhering sheet underlayment. Lap sides of felt over self-adhering sheet underlayment not less than 3 inches in direction that sheds water. Lap ends of felt not less than 6 inches over self-adhering sheet underlayment.
 2. Install fasteners at no more than 36 inches o.c.
- C. Double-Layer Felt Underlayment: Install on roof deck parallel with and starting at the eaves. Install a 19-inch-wide starter course at eaves and completely cover with full-width second course. Install succeeding courses lapping previous courses 19 inches in shingle fashion. Lap ends a minimum of 6 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with roofing nails.
1. Apply a continuous layer of asphalt roofing cement over starter course and on felt-underlayment surface to be concealed by succeeding courses as each felt course is installed. Apply at locations indicated on Drawings.
 2. Install felt underlayment on roof sheathing not covered by self-adhering sheet underlayment. Lap edges over self-adhering sheet underlayment not less than 3 inches in direction that sheds water.

3. Terminate felt underlayment flush against sidewalls, curbs, chimneys, and other roof projections.
 4. Install fasteners at no more than 36 inch o.c.
- D. Synthetic Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides and ends and treat laps as recommended in writing by manufacturer. Stagger end laps between succeeding courses at interval recommended in writing by manufacturer. Fasten according to manufacturer's written instructions. Cover underlayment within period recommended in writing by manufacturer.
1. Install in single layer on roofs sloped at 4:12 and greater.
 2. Install in double layer on roofs sloped at less than 4:12.
- E. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install lapped in direction that sheds water. Lap sides not less than 3-1/2 inches. Lap ends not less than 6 inches staggered 24 inches between courses. Roll laps with roller. Cover underlayment within seven days.
1. Prime concrete and masonry surfaces to receive self-adhering sheet underlayment.
 2. Eaves: Extend from edges of eaves 24 inches beyond interior face of exterior wall.
 3. Rakes: Extend from edges of rake 24 inches beyond interior face of exterior wall.
 4. Valleys: Extend from lowest to highest point 18 inches on each side.
 5. Hips: Extend 18 inches on each side.
 6. Ridges: Extend 36 inches on each side.
 7. Sidewalls: Extend beyond sidewall 18 inches, and return vertically against sidewall not less than 4 inches.
 8. Roof Slope Transitions: Extend 18 inches on each roof slope.
- F. Concealed Valley Lining: For woven valleys. Comply with NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems." Install underlayment centered in valley and fastened to roof deck.
1. Lap roof-deck underlayment over valley underlayment at least 6 inches.
 2. Install a 36-inch-wide strip of granular-surfaced valley lining, with granular-surface face up, full-width sheet of synthetic underlayment centered in valley. Lap ends of strips at least 12 inches in direction to shed water, and seal with asphalt roofing cement. Fasten to roof deck.
- G. Granular-Surfaced, Open-Valley Lining: Comply with NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems." Install a 36-inch-wide felt underlayment centered in valley. Fasten to roof deck with roofing nails.
1. Lap roof-deck felt underlayment over valley felt underlayment at least 6 inches.
 2. Install an 18-inch-wide strip of valley lining centered in valley, with granular-surface face down. Install a second 36-inch-wide strip of valley lining centered in valley, with granular-surface face up. Lap ends of each strip at least 12 inches in direction to shed water, and seal with asphalt roofing cement. Stagger end laps between succeeding strips at least 72 inches. Fasten each strip to roof deck with roofing nails.

3.3 METAL FLASHING INSTALLATION

- A. General: Install metal flashings and other sheet metal to comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."

1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
- B. Rake Drip Edges: Install rake drip-edge flashings over underlayment and fasten to roof deck.
- C. Eave Drip Edges: Install eave drip-edge flashings below underlayment and fasten to roof sheathing.
- D. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.4 ASPHALT-SHINGLE INSTALLATION

- A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
- B. Install starter strip along lowest roof edge, consisting of an asphalt-shingle strip at least 7 inches wide with self-sealing strip face up at roof edge.
 1. Extend asphalt shingles 1/2 inch over fasciae at eaves and rakes.
 2. Install starter strip along rake edge.
- C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- D. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- E. Install asphalt shingles by single-strip column or racking method, maintaining uniform exposure. Install full-length first course followed by cut second course, repeating alternating pattern in succeeding courses.
- F. Fasten asphalt-shingle strips with a minimum of four roofing nails located according to manufacturer's written instructions.
 1. Where roof slope is less than 4:12, seal asphalt shingles with asphalt roofing cement spots.
 2. When ambient temperature during installation is below 50 deg F, seal asphalt shingles with asphalt roofing cement spots.
- G. Closed-Cut Valleys: Extend asphalt-shingle strips from one side of valley 12 inches beyond center of valley. Use one-piece shingle strips without joints in valley. Fasten with extra nail in upper end of shingle. Install asphalt-shingle courses from other side of valley and cut back to a straight line 2 inches short of valley centerline. Trim upper concealed corners of cut-back shingle strips.
 1. Do not nail asphalt shingles within 6 inches of valley center.
 2. Set trimmed, concealed-corner asphalt shingles in a 3-inch-wide bed of asphalt roofing cement.
- H. Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.

3.5 ROOFING INSTALLER'S WARRANTY

- A. Provide a Warranty made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to the work and other parts of the building, and to building contents, caused by:
 - a. Lightning;
 - b. Peak gust wind speed exceeding those indicated in the specification/required by State of New Jersey for jurisdiction;
 - c. Fire;
 - d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. Vapor condensation on bottom of roofing; and
 - g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
 2. When the work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
 3. Roofing Installer is responsible for damage to the work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of the work.
 4. During Warranty Period, if Owner allows alteration of the work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of the alterations, but only to the extent the alterations affect the work covered by this Warranty. If Owner engages Roofing Installer to perform the alterations, Warranty shall not become null and void unless Roofing Installer, before starting the alterations, notified Owner in writing, showing reasonable cause for claim, that the alterations would likely damage or deteriorate the work, thereby reasonably justifying a limitation or termination of this Warranty.
 5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a use or service more severe than originally specified, this Warranty shall become null and void on date of the change, but only to the extent the change affects the work covered by this Warranty.
 6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect the work and to examine evidence of such leaks, defects, or deterioration.
 7. This Warranty is recognized to be the only warranty of Roofing Installer on the work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of the work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

END OF SECTION 073113

SECTION 075423 - THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Adhered thermoplastic polyolefin (TPO) roofing system.
2. Self-adhering, thermoplastic polyolefin (TPO) roofing system.
3. Mechanically fastened, thermoplastic polyolefin (TPO) roofing system.
4. Loosely laid and ballasted, thermoplastic polyolefin (TPO) roofing system.
5. Substrate board.
6. Vapor retarder.
7. Roof insulation.
8. Cover board.
9. Walkways.

- B. Section includes installation of sound-absorbing insulation strips in ribs of roof deck. Sound-absorbing insulation strips are furnished under Section 053100 "Steel Decking."

C. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.
2. Section 061600 "Sheathing" for wood-based, structural-use roof deck panels.
3. Section 072100 "Thermal Insulation" for insulation beneath the roof deck.
4. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
5. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.

2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. For insulation and roof system component fasteners, include copy of FM Approvals' RoofNav listing.
- B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:
 1. Layout and thickness of insulation.
 2. Base flashings and membrane termination details.
 3. Flashing details at penetrations.
 4. Tapered insulation layout, thickness, and slopes.
 5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
 6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
 7. Tie-in with adjoining air barrier.
- C. Samples for Verification: For the following products:
 1. Roof membrane and flashings, of color required.
- D. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Manufacturer Certificates:
 1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - a. Submit evidence of compliance with performance requirements.
 2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

- C. Product Test Reports: For roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.
- D. Evaluation Reports: For components of roofing system, from ICC-ES.
- E. Field Test Reports:
 - 1. Concrete internal relative humidity test reports.
 - 2. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.
- F. Field quality-control reports.
- G. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals.
- B. Certified statement from existing roof membrane manufacturer stating that existing roof warranty has not been affected by Work performed under this Section.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.
- B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, vapor retarder, substrate board, and other components of roofing system.
 - 2. Warranty Period: 20 years from date of Substantial Completion.
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, for the following warranty period:
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.
 - 1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
 - 2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746, ASTM D4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to FM Approvals 4474, UL 580, or UL 1897:
 - 1. Zone 2 (Roof Area Perimeter): 150 lbf/sq. ft..
 - a. Location: From roof edge to three inches inside roof edge.
- D. FM Approvals' RoofNav Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and shall be listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.

- E. ENERGY STAR Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.
- F. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.
- G. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- H. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.2 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

- A. TPO Sheet: ASTM D6878/D6878M, internally fabric- or scrim-reinforced, self-adhering TPO sheet.
 - 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Carlisle SynTec Incorporated; Carlisle Construction Materials.](#)
 - b. [GAF.](#)
 - c. [Johns Manville; a Berkshire Hathaway company.](#)
 - d. Approved Equal.
 - 2. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.
 - 3. Thickness: 60 mils, nominal.
 - 4. Exposed Face Color: White.

2.3 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
 - 1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils thick, minimum, of same color as TPO sheet.
- C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- D. Roof Vents: As recommended by roof membrane manufacturer.
 - 1. Size: Not less than 4-inch diameter.
- E. Bonding Adhesive: Manufacturer's standard, water based.
- F. Slip Sheet: ASTM D2178/D2178M, Type IV; glass fiber; asphalt-impregnated felt.
- G. Slip Sheet: Manufacturer's standard, of thickness required for application.

- H. Vented Base Sheet: ASTM D4897/D4897M, Type II; nonperforated, asphalt-impregnated fiberglass reinforced, with mineral granular patterned surfacing on bottom surface.
- I. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- J. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick, prepunched.
- K. Ballast Retaining Bar: Perimeter securement system consisting of a slotted extruded-aluminum retention bar with an integrated compression fastening strip.
 - 1. Fasteners: 1-1/2-inch stainless steel fasteners with neoprene washers.
- L. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.
- M. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.4 SUBSTRATE BOARDS

- A. Substrate Board: ASTM C1396/C1396M, Type X gypsum board.
 - 1. Thickness: 5/8 inch.
- B. Substrate Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum board or ASTM C1278/C1278M, fiber-reinforced gypsum board.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Certainteed; SAINT-GOBAIN.
 - b. Georgia-Pacific Gypsum LLC.
 - c. National Gypsum Company.
 - d. USG Corporation.
 - e. Approved Equal.
 - 2. Thickness: Type X, 5/8 inch thick.
 - 3. Surface Finish: Factory primed.
- C. Substrate Board: ASTM C728, perlite board, seal coated.
 - 1. Thickness: 1 inch.
- D. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

2.5 VAPOR RETARDER

- A. Polyethylene Film: ASTM D4397, 6 mils thick, minimum, with maximum permeance rating of 0.13 perm.
 - 1. Tape: Pressure-sensitive tape of type recommended by vapor retarder manufacturer for sealing joints and penetrations in vapor retarder.
 - 2. Adhesive: Manufacturer's standard lap adhesive, listed by FM Approvals for vapor retarder application.
- B. Laminated Sheet: Two-layer, fire-retardant polyethylene laminate, reinforced with cord grid.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Reef Industries, Inc.
 - b. Approved Equal.
 - 2. Permeance Rating: Not more than 0.062 perm.
 - 3. Flame-Spread Index: Not more than 5 when tested in accordance with ASTM E84.
 - 4. Smoke-Developed Index: Not more than 35 when tested in accordance with ASTM E84.
 - 5. Tape: Pressure-sensitive tape of type recommended by vapor retarder manufacturer for sealing joints and penetrations in vapor retarder.
- C. Self-Adhering-Sheet Vapor Retarder: ASTM D1970/D1970M, polyethylene film laminated to layer of rubberized asphalt adhesive, minimum 40-mil total thickness; maximum permeance rating of 0.1 perm; cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor retarder manufacturer.
- D. Self-Adhering-Sheet Vapor Retarder: Polyethylene film laminated to layer of butyl rubber adhesive, minimum 30-mil total thickness; maximum permeance rating of 0.1 perm; cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor retarder manufacturer.
- E. Glass-Fiber Felts: ASTM D2178/D2178M, Type IV; asphalt impregnated.

2.6 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by TPO roof membrane manufacturer, approved for use in FM Approvals' RoofNav listed roof assemblies.
- B. Tapered Insulation: Provide factory-tapered insulation boards.
 - 1. Material: Match roof insulation.
 - 2. Minimum Thickness: 1/4 inch.
 - 3. Slope:
 - a. Roof Field: 1/4 inch per foot unless otherwise indicated on Drawings.
 - b. Saddles and Crickets: 1/2 inch per foot unless otherwise indicated on Drawings.

2.7 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

- B. Fasteners: Factory-coated steel fasteners with metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
- C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
 - 1. Modified asphaltic, asbestos-free, cold-applied adhesive.
 - 2. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
 - 3. Full-spread, spray-applied, low-rise, two-component urethane adhesive.
- D. Cover Board: ASTM C1289 Type II, Class 4, Grade 1, 1/2-inch-thick polyisocyanurate, with a minimum compressive strength of 80 psi.
- E. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric; water permeable and resistant to UV degradation; type and weight as recommended by roofing system manufacturer for application.

2.8 ASPHALT MATERIALS

- A. Roofing Asphalt: ASTM D312/D312M, Type III or Type IV.
- B. Asphalt Primer: ASTM D41/D41M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100 "Steel Decking."
 - 4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
 - 5. Verify that concrete substrate is visibly dry and free of moisture, and that minimum concrete internal relative humidity is not more than [75] <Insert number> percent, or as recommended by roofing system manufacturer, when tested according to ASTM F2170.
 - a. Test Frequency: One test probe per each [1000 sq. ft.] <Insert area>, or portion thereof, of roof deck, with not less than three tests probes.
 - b. Submit test reports within 24 hours after performing tests.
 - 6. Verify that concrete-curing compounds that will impair adhesion of roofing components to roof deck have been removed.
 - 7. Verify that joints in precast concrete roof decks have been grouted flush with top of concrete.

8. Verify that minimum curing period recommended by roofing system manufacturer for lightweight insulating concrete roof decks has passed.
9. Verify any damaged sections of cementitious wood-fiber decks have been repaired or replaced.
10. Verify adjacent cementitious wood-fiber panels are vertically aligned to within 1/8 inch at top surface.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Perform fastener-pullout tests according to roof system manufacturer's written instructions.
 1. Submit test result within 24 hours after performing tests.
 - a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.
- D. Install sound-absorbing insulation strips according to acoustical roof deck manufacturer's written instructions.

3.3 INSTALLATION OF ROOFING, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav listed roof assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning Work on adjoining roofing.
- C. Install roof membrane and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty for existing roofing system.

3.4 INSTALLATION OF SUBSTRATE BOARD

- A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches in adjacent rows.
 1. At steel roof decks, install substrate board at right angle to flutes of deck.
 - a. Locate end joints over crests of steel roof deck.
 2. Tightly butt substrate boards together.

3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
4. Fasten substrate board to top flanges of steel deck according to recommendations in FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29.
5. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.
6. Loosely lay substrate board over roof deck.

3.5 INSTALLATION OF VAPOR RETARDER

- A. Polyethylene Film: Loosely lay polyethylene-film vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 and 6 inches, respectively.
 1. Extend vertically up parapet walls and projections to a minimum height equal to height of insulation and cover board.
 2. Continuously seal side and end laps with adhesive.
- B. Laminate Sheet: Loosely lay laminate-sheet vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 and 6 inches, respectively.
 1. Extend vertically up parapet walls and projections to a minimum height equal to height of insulation and cover board.
 2. Continuously seal side and end laps with tape.
- C. Self-Adhering-Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2 and 6 inches, respectively.
 1. Extend vertically up parapet walls and projections to a minimum height equal to height of insulation and cover board.
 2. Seal laps by rolling.
- D. Built-Up Vapor Retarder: Install two glass-fiber felt plies lapping each felt 19 inches over preceding felt.
 1. Extend vertically up parapet walls and projections to a minimum height equal to height of insulation and cover board.
 2. Embed each felt in a solid mopping of hot roofing asphalt.
 3. Glaze coat completed surface with hot roofing asphalt.
 4. Apply hot roofing asphalt within plus or minus 25 deg F of equiviscous temperature.
- E. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.6 INSTALLATION OF INSULATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.

- B. Comply with roofing system and roof insulation manufacturer's written instructions for installing roof insulation.
- C. Installation Over Wood Decking:
1. Mechanically fasten slip sheet to roof deck using mechanical fasteners specifically designed and sized for fastening slip sheet to wood decks.
 - a. Fasten slip sheet according to requirements in SPRI's Directory of Roof Assemblies for specified Wind Uplift Load Capacity.
 - b. Fasten slip sheet to resist specified uplift pressure at corners, perimeter, and field of roof.
 2. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows.
 - a. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
 - b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - d. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation so that water flow is unrestricted.
 - e. Fill gaps exceeding 1/4 inch with insulation.
 - f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - g. Loosely lay base layer of insulation units over substrate.
 3. Mechanically attach base layer of insulation and substrate board using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to wood decks.
 - a. Fasten insulation according to requirements in SPRI's Directory of Roof Assemblies for specified Wind Uplift Load Capacity.
 - b. Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.
 4. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.
 - a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
 - b. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.
 - c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation so that water flow is unrestricted.
 - f. Fill gaps exceeding 1/4 inch with insulation.
 - g. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - h. Loosely lay each layer of insulation units over substrate.
 - i. Adhere each layer of insulation to substrate using adhesive according to SPRI's Directory of Roof Assemblies listed roof assembly requirements for specified Wind Uplift Load Capacity and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
 - 1) Set each layer of insulation in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.

- 2) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
- 3) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.7 INSTALLATION OF COVER BOARDS

- A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.
 1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 2. At internal roof drains, conform to slope of drain sump.
 - a. Trim cover board so that water flow is unrestricted.
 3. Cut and fit cover board tight to nailers, projections, and penetrations.
 4. Loosely lay cover board over substrate.
 5. Adhere cover board to substrate using adhesive according to FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
 - a. Set cover board in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.
 - b. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
 - c. Set cover board in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.
- B. Install slip sheet over cover board and beneath roof membrane.

3.8 INSTALLATION OF SELF-ADHERING ROOF MEMBRANE

- A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.
- B. Unroll roof membrane and allow to relax before installing.
- C. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer.
 1. Stagger end laps.
- E. Fold roof membrane to expose half of sheet width's bottom surface.
 1. Remove release liner on exposed half of sheet.
 2. Roll roof membrane over substrate while avoiding wrinkles.
- F. Fold remaining half of roof membrane to expose bottom surface.
 1. Remove release liner on exposed half of sheet.
 2. Roll roof membrane over substrate while avoiding wrinkles.

- G. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.
- H. Apply roof membrane with side laps shingled with slope of roof deck where possible.
- I. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings, to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity.
 - 2. Apply lap sealant to seal cut edges of roof membrane and flashing sheet.
 - 3. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
 - 4. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
- J. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.9 INSTALLATION OF BASE FLASHING

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.10 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075423

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Formed roof-drainage sheet metal fabrications.
 - 2. Formed low-slope roof sheet metal fabrications.
 - 3. Formed steep-slope roof sheet metal fabrications.
 - 4. Formed wall sheet metal fabrications.
 - 5. Formed equipment support flashing.
 - 6. Formed overhead-piping safety pans.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.

1.3 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: For sheet metal flashing and trim.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
 - 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
 - 4. Include details for forming, including profiles, shapes, seams, and dimensions.
 - 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 6. Include details of termination points and assemblies.

7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
 8. Include details of roof-penetration flashing.
 9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
 10. Include details of special conditions.
 11. Include details of connections to adjoining work.
 12. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.
- C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.
- D. Samples for Verification: For each type of exposed finish.
1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
 2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
 3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
 4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Certificates: For each type of coping and roof edge flashing that is SPRI ES-1 tested and FM Approvals approved.
- C. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
1. For copings and roof edge flashings that are SPRI ES-1 tested and FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockup of typical roof edge eave, including fascia, fascia trim, apron flashing, approximately 10 feet long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.9 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. FM Approvals Listing: Manufacture and install roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-60. Identify materials with name of fabricator and design approved by FM Approvals.

- D. SPRI Wind Design Standard: Manufacture and install roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:
 - 1. Design Pressure: As designated for the region.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
 - 1. Color Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
 - a. Color: As selected by Architect from full range of industry colors and color densities.
 - b. Color Range: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
 - 2. Color: [As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range] <Insert color>.

2.3 UNDERLAYMENT MATERIALS

- A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.
- B. Synthetic Underlayment: Laminated or reinforced, woven polyethylene or polypropylene, synthetic roofing underlayment; bitumen free; slip resistant; suitable for high temperatures over 220 deg F; and complying with physical requirements of ASTM D 226/D 226M for Type I and Type II felts.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Atlas Roofing Corporation.
 - b. Kirsch Building Products, LLC.
 - c. SDP Advanced Polymer Products Inc.
- C. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlisle Residential; a division of Carlisle Construction Materials.
 - b. Henry Company.

- c. [Kirsch Building Products, LLC](#).
 - d. [Owens Corning](#).
 - 2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
 - 3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.
- D. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
- 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 2. Obtain field measurements for accurate fit before shop fabrication.
 3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- E. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- H. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.
- I. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter

thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.

1. Gutter Profile: Style K according to cited sheet metal standard.
 2. Expansion Joints: Lap type.
 3. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen.
 4. Gutters with Girth up to 15 Inches: Fabricate from the following materials:
 - a. Aluminum: 0.032 inch thick.
- B. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.
1. Fabricated Hanger Style: Fig 1-35A according to SMACNA's "Architectural Sheet Metal Manual."
 2. Fabricate from the following materials:
 - a. Aluminum: 0.024 inch thick.

2.7 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Drip Edges: Fabricate from the following materials:
1. Aluminum: 0.032 inch thick.
- B. Eave, Rake, Ridge, and Hip Flashing: Fabricate from the following materials:
1. Aluminum: 0.032 inch thick.
- C. Roof-Penetration Flashing: Fabricate from the following materials:
1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

2.8 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following materials:
1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.
- B. Overhead-Piping Safety Pans: Fabricate from the following materials:
1. Aluminum-Zinc Alloy-Coated Steel: 0.040 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
1. Verify compliance with requirements for installation tolerances of substrates.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.
- B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, according to manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.
- C. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.
- D. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 2. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 - 3. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 - 4. Torch cutting of sheet metal flashing and trim is not permitted.
 - 5. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
 - 1. Coat concealed side of uncoated-aluminum stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.4 ROOF-DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Hanging Gutters: Join sections with riveted joints. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.
1. Fasten gutter spacers to front and back of gutter.
 2. Anchor gutter with gutter brackets and straps spaced not more than 24 inches apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.
 3. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.
 4. Install continuous gutter screens on gutters with noncorrosive fasteners, hinged to swing open for cleaning gutters.
- C. Downspouts: Join sections with 1-1/2-inch telescoping joints.
1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c.
 2. Provide elbows at base of downspout to direct water away from building.
 3. Connect downspouts to underground drainage system.

3.5 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
- C. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.
- D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.6 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.
- B. Overhead-Piping Safety Pans: Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

3.7 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.8 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean off excess sealants.

- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in horizontal assemblies.
 - 3. Penetrations in smoke barriers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
 - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Approval according to FM Approval 4991, "Approval Standard for Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek Group in its "Directory of Listed Building Products."
 - 3) FM Approval in its "Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products.
 - b. Grabber Construction Products.
 - c. Hilti, Inc.
 - d. Tremco, Inc.
 - e. Approved Equal.

- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
 - 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
 - 3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
- D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.
 - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E84.
- F. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
 - 1. Permanent forming/damming/backing materials.
 - 2. Substrate primers.
 - 3. Collars.
 - 4. Steel sleeves.

2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.

- E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.

2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's name, address, and phone number.
 3. Designation of applicable testing and inspecting agency.

4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413

SECTION 079200 - JOINT SEALANTS**TIPS:**

To view non-printing **Editor's Notes** that provide guidance for editing, click on MasterWorks/Single-File Formatting/Toggle/Editor's Notes.

To read **detailed research, technical information about products and materials, and coordination checklists**, click on MasterWorks/Supporting Information.

Content Requests:

[<Double click here to submit questions, comments, or suggested edits to this Section.>](#)

Access Manufacturer-Provided, AIA MasterSpec-Based Sections:

[<Double click here for this Section based on specific manufacturer's products set as Basis-of-Design at ProductMasterSpec.com.>](#)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Immersible joint sealants.
5. Silyl-terminated polyether joint sealants.
6. Mildew-resistant joint sealants.
7. Polysulfide joint sealants.
8. Butyl joint sealants.
9. Latex joint sealants.

B. Related Requirements:

1. Section 079100 "Preformed Joint Seals" for preformed compressible foam and precured joint seals.
2. Section 079219 "Acoustical Joint Sealants" for sealing joints in sound-rated construction.
3. Section 321373 "Concrete Paving Joint Sealants" for sealing joints in paved roads, parking lots, walkways, and curbing.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]** **<Insert location>**.

1.4 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Sustainable Design Submittals:
 - 1. [<Double click to insert sustainable design text for sealants.>](#)
- C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- D. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- E. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Product Test Reports: For each kind of joint sealant, for tests performed by [**manufacturer and witnessed by a qualified testing agency**] [**a qualified testing agency**].
- C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:
 - 1. Joint-sealant location and designation.
 - 2. Manufacturer and product name.
 - 3. Type of substrate material.
 - 4. Proposed test.
 - 5. Number of samples required.
- D. Preconstruction Laboratory Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.
- E. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.
- F. Field-Adhesion-Test Reports: For each sealant application tested.

G. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: Qualified according to ASTM C1021 to conduct the testing indicated.
- C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Adhesion Testing: Use ASTM C794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Compatibility Testing: Use ASTM C1087 to determine sealant compatibility when in contact with glazing and gasket materials.
 - 3. Stain Testing: Use ASTM C1248 to determine stain potential of sealant when in contact with [stone] [masonry] <Insert substrate> substrates.
 - 4. Submit manufacturer's recommended number of pieces of each type of material, including joint substrates, joint-sealant backings, and miscellaneous materials.
 - 5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 6. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
 - 7. Testing will not be required if joint-sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, staining of, and compatibility with joint substrates and other materials matching those submitted.
- B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
 - 1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
 - 2. Conduct field tests for each kind of sealant and joint substrate.
 - 3. Notify Architect seven days in advance of dates and times when test joints will be erected.
 - 4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.8 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer[**or are below 40 deg F**].
 2. When joint substrates are wet.
 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.9 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: [**Two**] <Insert number> years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: [**Five**] <Insert number> years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 2. Disintegration of joint substrates from causes exceeding design specifications.
 3. Mechanical damage caused by individuals, tools, or other outside agents.
 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. [<Double click to insert sustainable design text for sealants and primers.>](#)

1. [<Double click to insert sustainable design text for sealants.>](#)

C. Colors of Exposed Joint Sealants: [As indicated by manufacturer's designations] [Match Architect's samples] [As selected by Architect from manufacturer's full range].

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

B. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

C. Silicone, S, NS, 35, NT: Single-component, nonsag, plus 35 percent and minus 35 percent movement capability. nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 35, Use NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

D. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

E. Silicone, Acid Curing, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant: ASTM C920, Type S, Grade NS, Class 25, Use NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

F. Silicone, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses T and NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

G. Silicone, S, NS, 50, T, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Uses T and NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

H. Silicone, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Uses T and NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- I. Silicone, S, P, 100/50, T, NT: Single-component, pourable, plus 100 percent and minus 50 percent movement capability traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade P, Class 100/50, Uses T and NT.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- J. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- K. Silicone, M, P, 100/50, T, NT: Multicomponent, pourable, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type M, Grade P, Class 100/50, Uses T and NT.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2.3 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C1248.
- B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- C. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- D. Silicone, Nonstaining, S, NS, 100/50, T, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses T and NT.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- E. Silicone, Nonstaining, M, NS, 50, NT: Nonstaining, multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type M, Grade NS, Class 50, Use NT.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2.4 URETHANE JOINT SEALANTS

- A. Urethane, S, NS, 25, NT: Single-component, nonsag, nontraffic-use, plus 25 percent and minus 25 percent movement capability, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- B. Urethane, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses T and NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- C. Urethane, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Uses T and NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- D. Urethane, S, P, 35, T, NT: Single-component, pourable, plus 35 percent and minus 35 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 35, Uses T and NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- E. Urethane, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- F. Urethane, M, NS, 50, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 50, Use NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- G. Urethane, M, NS, 25, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 25, Use NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- H. Urethane, M, NS, 50, T, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 50, Uses T and NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- I. Urethane, M, NS, 25, T, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 25, Uses T and NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- J. Urethane, M, P, 50, T, NT: Multicomponent, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade P, Class 50, Uses T and NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- K. Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade P, Class 25, Uses T and NT.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2.5 IMMERSIBLE JOINT SEALANTS

- A. Immersible Joint Sealants. Suitable for immersion in liquids; ASTM C1247, [Class 1] [Class 2]; tested in deionized water unless otherwise indicated

- B. Urethane, Immersible, S, NS, 100/50, NT, I: Immersible, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses NT, and I.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- C. Urethane, Immersible, S, NS, 35, NT, I: Immersible, single-component, nonsag, plus 35 percent and minus 35 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 35, Use NT and I.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- D. Urethane, Immersible, S, NS, 50, T, NT, I: Immersible, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 50, Uses T, NT, and I.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- E. Urethane, Immersible, S, NS, 35, T, NT, I: Immersible, single-component, nonsag, plus 35 percent and minus 35 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 35, Uses T, NT, and I.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- F. Urethane, Immersible, S, NS, 25, T, NT, I: Immersible, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade NS, Class 25, Uses T, NT, and I.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- G. Urethane, Immersible, S, P, 50, T, NT, I: Immersible, single-component, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 50, Uses T, NT, and I.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- H. Urethane, Immersible, S, P, 25, T, NT, I: Immersible, single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T, NT, and I.

1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- I. Polysulfide, Immersible, M, NS, 25, NT, I: Immersible, multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, polysulfide joint sealant; ASTM C920, Type M, Grade NS, Class 25, Uses NT and I.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- J. Urethane, Immersible, M, NS, 50, T, NT, I: Immersible, multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 50, Uses T, NT, and I.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- K. Urethane, Immersible, M, NS, 25, T, NT, I: Immersible, multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade NS, Class 25, Uses T, NT, and I.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- L. Polysulfide, Immersible, M, NS, 25, T, NT, I: Immersible, multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, polysulfide joint sealant; ASTM C920, Type M, Grade NS, Class 25, Uses T, NT, and I.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- M. Urethane, Immersible, M, P, 25, T, NT, I: Immersible, multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C920, Type M, Grade P, Class 25, Uses T, NT, and I.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2.6 SILYL-TERMINATED POLYETHER (STPE) JOINT SEALANTS

- A. STPE, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, silyl-terminated polyether joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- B. STPE, S, NS, 35, NT: Single-component, nonsag, plus 35 percent and minus 35 percent movement capability, nontraffic-use, silyl-terminated polyether joint sealant; ASTM C920, Type S, Grade NS, Class 35, Use NT.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- C. STPE, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, silyl-terminated polyether joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- D. STPE, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, silyl-terminated polyether joint sealant; ASTM C920, Type S, Grade NS, Class 100, Uses T and NT.
 - 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- E. STPE, S, NS, 50, T, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, silyl-terminated polyether joint sealant; ASTM C920, Type S, Grade NS, Class 50, Uses T and NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- F. STPE, S, NS, 35, T, NT: Single-component, nonsag, plus 35 percent and minus 35 percent movement capability, traffic- and nontraffic-use, silyl-terminated polyether joint sealant; ASTM C920, Type S, Grade NS, Class 35, Uses T and NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- G. STPE, S, NS, 25, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, silyl-terminated polyether joint sealant; ASTM C920, Type S, Grade NS, Class 25, Uses T and NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- H. STPE, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, silyl-terminated polyether joint sealant; ASTM C920, Type S, Grade P, Class 25, Uses T and NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2.7 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- C. STPE, Mildew Resistant, S, NS, 50, NT: Mildew-resistant, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, silyl-terminated polyether joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2.8 POLYSULFIDE JOINT SEALANTS

- A. Polysulfide, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, polysulfide joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)
- B. Polysulfide, M, NS, 25, T, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, polysulfide joint sealant; ASTM C920, Type M, Grade NS, Class 25, Use NT.
1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- C. Polysulfide, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, polysulfide joint sealant; ASTM C920, Type M, Grade P, Class 25, Uses T and NT.

- 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2.9 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C1311.

- 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2.10 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

- 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

2.11 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

- 1. [<Double click here to find, evaluate, and insert list of manufacturers and products.>](#)

- B. Cylindrical Sealant Backings: ASTM C1330, [Type C (closed-cell material with a surface skin)] [Type O (open-cell material)] [Type B (bicellular material with a surface skin)] [or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated], and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.12 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - d. Exterior insulation and finish systems.
 - e. **<Insert other porous joint substrate>**.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
 - e. **<Insert other nonporous joint substrate>**.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by

cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C1193 unless otherwise indicated.
 - 4. Provide flush joint profile at **[locations indicated on Drawings]** <Insert locations> according to Figure 8B in ASTM C1193.
 - 5. Provide recessed joint configuration of recess depth and at **[locations indicated on Drawings]** <Insert locations> according to Figure 8C in ASTM C1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform [10] <Insert number> tests for the first [1000 feet] <Insert dimension> of joint length for each kind of sealant and joint substrate.
 - b. Perform one test for each [1000 feet] <Insert dimension> of joint length thereafter or one test per each floor per elevation.
 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
 4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
 5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces[<JS-#>].

1. Joint Locations:
 - a. Control and expansion joints in brick pavers.
 - b. Isolation and contraction joints in cast-in-place concrete slabs.
 - c. Joints between plant-precast architectural concrete paving units.
 - d. Joints in stone paving units[, **including steps**].
 - e. Tile control and expansion joints.
 - f. Joints between different materials listed above.
 - g. **<Insert other joints>**.
 - h. Other joints as indicated on Drawings.
 2. Joint Sealant: [**Urethane, M, P, 50, T, NT**] **<Insert joint sealant>**.
 3. Joint-Sealant Color: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range of colors**] **<Insert color>**.
- B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion[**<JS-#>**].
1. Joint Locations:
 - a. Joints in pedestrian plazas.
 - b. Joints in swimming pool decks.
 - c. **<Insert other joints>**.
 - d. Other joints as indicated on Drawings.
 2. Joint Sealant: [**Urethane, immersible, S, P, 25, T, NT, I**] **<Insert joint sealant>**.
 3. Joint-Sealant Color: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range of colors**] **<Insert color>**.
- C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces[**<JS-#>**].
1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Joints between plant-precast architectural concrete units.
 - c. Control and expansion joints in unit masonry.
 - d. Joints in dimension stone cladding.
 - e. Joints in glass unit masonry assemblies.
 - f. Joints in exterior insulation and finish systems.
 - g. Joints between metal panels.
 - h. Joints between different materials listed above.
 - i. Perimeter joints between materials listed above and frames of [**doors**] [**windows**] [**and**] [**louvers**].
 - j. Control and expansion joints in [**ceilings**] [**and other**] [**overhead surfaces**].
 - k. **<Insert other joints>**.
 - l. Other joints as indicated on Drawings.
 2. Joint Sealant: [**Silicone, nonstaining, S, NS, 50, NT**] **<Insert joint sealant>**.
 3. Joint-Sealant Color: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range of colors**] **<Insert color>**.
- D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces[**<JS-#>**].
1. Joint Locations:

- a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in stone flooring.
 - c. Control and expansion joints in brick flooring.
 - d. Control and expansion joints in tile flooring.
 - e. **<Insert other joints>**.
 - f. Other joints as indicated on Drawings.
2. Joint Sealant: **[Urethane, S, P, 25, T, NT] <Insert joint sealant>**.
 3. Joint-Sealant Color: **[As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range of colors] <Insert color>**.
- E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces[**<JS-#>**].
1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Tile control and expansion joints.
 - c. Vertical joints on exposed surfaces of **[unit masonry] [concrete] [walls] [and] [partitions]**.
 - d. Joints on underside of plant-precast structural concrete **[beams] [and] [planks]**.
 - e. **<Insert other joints>**.
 - f. Other joints as indicated on Drawings.
 2. Joint Sealant: **[Urethane, S, NS, 25, NT] <Insert joint sealant>**.
 3. Joint-Sealant Color: **[As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range of colors] <Insert color>**.
- F. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement[**<JS-#>**].
1. Joint Locations:
 - a. Control joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints between interior wall surfaces and frames of **[interior doors] [windows] [and] [elevator entrances]**.
 - c. **<Insert other joints>**.
 - d. Other joints as indicated on Drawings.
 2. Joint Sealant: **[Acrylic latex] <Insert joint sealant>**.
 3. Joint-Sealant Color: **[As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range of colors] <Insert color>**.
- G. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces[**<JS-#>**].
1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 - c. **<Insert other joints>**.
 - d. Other joints as indicated on Drawings.
 2. Joint Sealant: **[Silicone, mildew resistant, acid curing, S, NS, 25, NT] <Insert joint sealant>**.
 3. Joint-Sealant Color: **[As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range of colors] <Insert color>**.

JOINT SEALANTS

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- H. Joint-Sealant Application: Concealed mastics[<JS-#>].
1. Joint Locations:
 - a. Aluminum thresholds.
 - b. Sill plates.
 - c. <Insert other joints>.
 - d. Other joints as indicated on Drawings.
 2. Joint Sealant: [**Butyl-rubber based**] <Insert joint sealant>.
 3. Joint-Sealant Color: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range of colors**] <Insert color>.

END OF SECTION 079200

SECTION 080352 - HISTORIC TREATMENT OF WOOD WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes historic treatment of wood windows in the form of the following:
 - 1. Repairing wood windows and trim.
 - 2. Reglazing.
 - 3. Repairing, refinishing, and replacing hardware.
- B. Related Requirements:
 - 1. Section 013591 "Historic Treatment Procedures" for general historic treatment requirements.
 - 2. Section 024296 "Historic Removal and Dismantling" for historic removal and dismantling work.

1.3 DEFINITIONS

- A. Glazing: Includes glass, glazing points, glazing tapes, glazing sealants, and glazing compounds.
- B. Window: Includes window frame, sash, hardware, storm window, and exterior and interior shutters unless otherwise indicated by context.
- C. Wood Window Component Terminology: Wood window components for historic treatment work include the following classifications:
 - 1. Frame Components: Head, jambs, and sill.
 - 2. Sash Components: Stiles and rails, parting bead, stop, and muntins.
 - 3. Exterior Trim: Exterior casing, and drip cap.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review minutes of Preliminary Historic Treatment Conference that pertain to historic treatment of wood windows.
 - 2. Review methods and procedures related to historic treatment of wood windows including, but not limited to, the following:
 - a. Historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, sequencing, tolerances, and required clearances.
 - c. Fire-protection plan.

- d. Wood window historic treatment program.
- e. Coordination with building occupants.

1.5 SEQUENCING AND SCHEDULING

- A. Perform historic treatment of wood windows in the following sequence, which includes work specified in this and other Sections:
 - 1. Label each window frame with permanent opening-identification number in inconspicuous location, where required to removed to undertake repairs.
 - 2. Tag existing window sash, storm windows, and shutters with opening-identification numbers and remove for on-site or off-site repair. Indicate on tags the locations on window of each component, such as "top sash," "bottom sash," "left shutter," and "right shutter."
 - 3. Remove window, dismantle hardware, and tag hardware with opening-identification numbers.
 - 4. Install temporary protection and security at window openings.
 - 5. In the shop, label each sash, storm window, shutter, and louvered blind unit with permanent opening-identification number in inconspicuous location and remove site-applied tags.
 - 6. Sort units by condition, separating those that need extensive repair.
 - 7. Clean surfaces.
 - 8. General Wood-Repair Sequence:
 - a. Remove paint to bare wood.
 - b. Rack frames slightly to inject adhesive into mortise and tenon joints; square frames to proper fit before adhesive sets.
 - c. If thicker than original glass is required, rout existing muntins to required rebate size.
 - d. Repair wood by consolidation, member replacement, partial member replacement, and patching.
 - e. Sand, prime, fill, sand again, and prime surfaces again for refinishing.
 - 9. Repair, refinish, and replace hardware if required. Reinstall operating hardware.
 - 10. Install glazing.
 - 11. Remove temporary protection and security at window openings.
 - 12. Reinstall units.
 - 13. Apply finish coats.
 - 14. Install remaining hardware and weather stripping.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.
- B. Shop Drawings:
 - 1. Include plans, elevations, and sections showing locations and extent of repair and replacement work, with enlarged details of replacement parts indicating materials, profiles, joinery, reinforcing, method of splicing into or attaching to existing wood window, accessory items, and finishes.

2. Include field-verified dimensions and the following:
 - a. Full-size shapes and profiles with complete dimensions for replacement components and their jointing, showing relation of existing to new components.
 - b. Templates and directions for installing hardware and anchorages.
 - c. Identification of each new unit and its corresponding window locations in the building on annotated plans and elevations.
 - d. Provisions for sealant joints and flashing as required for location.
- C. Samples for Initial Selection: For each type of exposed wood and finish.
 1. Identify wood species, cut, and other features.
 2. Include Samples of hardware and accessories involving color selection.
- D. Samples for Verification: For the following products in manufacturer's standard sizes unless otherwise indicated, finished as required for use in the Work:
 1. Replacement Units: 12-inch-long, full-size sash sections with applied finish.
 2. Replacement Members: 12 inches long for each replacement member, including parts of frame, sash, exterior trim, and interior trim.
 - a. Additional Samples of replacement members that show fabrication techniques, materials, and finishes as requested by Architect.
 3. Repaired Wood Window Members: Prepare Samples using existing wood window members removed from site, repaired, and prepared for refinishing.
 4. Refinished Wood Window Members: Prepare Samples using existing wood window members removed from site, repaired, and refinished.
 5. Hardware: Full-size units with each factory-applied or restored finish.
 6. Weather Stripping: 12-inch-long sections.
 7. Glass: 4" x 4" units of each type and appearance.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For historic treatment specialist including workers and wood-repair-material manufacturer.
- B. Wood Window Historic Treatment Program: Submit before work begins.
- C. Preconstruction Test Reports: For historic treatment of wood windows.

1.8 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: A qualified historic wood window specialist, experienced in repairing, refinishing, and replacing wood windows in whole and in part. Experience only in fabricating and installing new wood windows is insufficient experience for wood-window historic treatment work.

- B. Wood-Repair-Material Manufacturer Qualifications: A firm regularly engaged in producing wood consolidant and wood-patching compound that have been used for similar historic wood-treatment applications with successful results, and with factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.
- C. Wood Window Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic treatment work, including protection of surrounding materials and Project site.
 - 1. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.
- D. Mockups: Prepare mockups of historic treatment repair processes to demonstrate aesthetic effects and to set quality standards for materials and execution and for fabrication and installation. Prepare mockups so they are as inconspicuous as practicable.
 - 1. Locate mockups in locations that enable viewing under same conditions as the completed Work.
 - 2. Wood Window Repair: Prepare one entire window unit to serve as mockup to demonstrate samples of each type of repair of wood window members including frame, sash, glazing, and hardware.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Pack, deliver, and store products in suitable packs, heavy-duty cartons, or wooden crates; surround with sufficient packing material to ensure that products are not deformed, broken, or otherwise damaged.
- B. Store products inside a well-ventilated area and protect from weather, moisture, soiling, abrasion, extreme temperatures, and humidity, and where environmental conditions comply with manufacturer's requirements.

1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with historic treatment of wood windows only when existing and forecasted weather conditions are within the environmental limits set by each manufacturer's written instructions and specified requirements.

PART 2 - PRODUCTS

2.1 HISTORIC TREATMENT OF WOOD WINDOWS, GENERAL

- A. Quality Standard: Comply with applicable requirements in Section 12, "Historic Restoration Work," and related requirements in AWI/AWMAC/WI's "Architectural Woodwork Standards" for construction, finishes, grades of wood windows, and other requirements unless otherwise indicated.
 - 1. Exception: Industry practices cited in Section 12, Article 1.5, Industry Practices, of the Architectural Woodwork Standards do not apply to the work of this Section.

2.2 WOOD-REPLACEMENT MATERIALS

- A. Wood, General: Clear fine-grained lumber; kiln dried to a moisture content of 6 to 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide.
 - 1. Species: Match species of each existing type of wood component or assembly unless otherwise indicated.
- B. Frame Heads and Jambs: Match existing species or, if not readily available, Ponderosa pine, eastern white pine, or Idaho white pine.
- C. Exterior Trim: Match existing species.
- D. Sills: Match existing species or, if not readily available White oak.
- E. Sash Components: Match existing species or, if not readily available, Ponderosa pine, eastern white pine, or Idaho white pine.
- F. Interior Trim: Match existing species.

2.3 WOOD-REPAIR MATERIALS

- A. Source Limitations: Obtain wood consolidant and wood-patching compound from single source from single manufacturer.
- B. Wood Consolidant: Ready-to-use product designed to penetrate, consolidate, and strengthen soft fibers of wood materials that have deteriorated due to weathering and decay and designed specifically to enhance the bond of wood-patching compound to existing wood.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Abatron, Inc.; LiquidWood.
 - b. ConServ Epoxy LLC; Flexible Epoxy Consolidant 100.
 - c. Gougeon Brothers, Inc.; West System.
 - d. Protective Coating Company; PC-Rot Terminator.
 - e. System Three Resins, Inc.; RotFix.

- f. Or Approved Equal.
- C. Wood-Patching Compound: Two-part epoxy-resin wood-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of wood repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be designed for filling voids in damaged wood materials that have deteriorated due to weathering and decay. Compound shall be capable of filling deep holes and spreading to feather edge.
- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Abatron, Inc.; LiquidWood with WoodEpoxy.
 - b. Advanced Repair Technology, Inc.; Primatrate with Flex-Tec HV.
 - c. ConServ Epoxy LLC; Flexible Epoxy Consolidant 100 with Flexible Epoxy Patch 200.
 - d. Gougeon Brothers, Inc.; West System thickened with filler.
 - e. Polymeric Systems, Inc.; QuickWood.
 - f. Protective Coating Company; PC-Woody.
 - g. System Three Resins, Inc.; Sculpwood.
 - h. Or Approved Equal.

2.4 GLAZING MATERIALS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated and match existing.
- B. Patterned Glass: ASTM C 1036, Type II, Class 1, Form 3; Quality-Q6, Finish F2 (patterned both sides). Colored and textured art glass matching existing.
- C. Glazing Systems:
 - 1. Traditional Glazing Products: Glazing points and traditional linseed oil-based glazing putty.
 - 2. Primers and Cleaners for Glazing: As recommended in writing by glazing material manufacturer.

2.5 HARDWARE

- A. Window Hardware: Provide complete sets of window hardware consisting of sash balances, hinges, pulls, latches, and accessories indicated for each window or required for proper operation. Sets shall include replacement hardware to complement repaired and refinished, existing hardware. Window hardware shall smoothly operate, tightly close, and securely lock wood windows and be sized to accommodate sash or ventilator weight and dimensions.
- B. Replacement Hardware: Replace existing damaged or missing hardware with new hardware manufactured by one of the following:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Architectural Resource Center (The).
 - b. Ball and Ball.

- c. Blaine Window Hardware Inc.
- d. Bronze Craft Corporation (The).
- e. Phelps Company.
- f. Smith Restoration Sash.
- g. Or Approved Equal.

C. Material and Design:

- 1. Material: Match existing, unless otherwise indicated.
- 2. Design: Custom hardware to replicate type and appearance of existing hardware.
- 3. Weight and Pulley Sash-Balance: Existing weights and pulleys to remain. Reinstall after repair of window as required. Replace sash chords to match existing.
- 4. Replacement Window Hardware: Match existing window hardware of the following types:
 - a. Window lock.
 - b. Window latch.

D. Hardware Finishes: Comply with BHMA A156.18 for base material and finish requirements that match existing.

2.6 WEATHER STRIPPING

- A. Metal Weather Stripping: Bronze weather stripping; designed either as one piece to seal by sliding into a groove in the sash or as two pieces that interlock; and completely concealed when window is closed.
- 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Accurate Metal Weatherstrip Co. Inc.
 - b. Zero International, Inc.
 - c. William Killian Hardware, Inc. (Spring bronze);
 - d. Or Approved Equal.

2.7 MISCELLANEOUS MATERIALS

A. Cleaning Materials:

- 1. Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 1/2 cup of laundry detergent that contains no ammonia, 5 quarts of 5 percent sodium hypochlorite bleach, and 15 quarts of warm water for each 5 gal. of solution required.
- 2. Mildewcide: Commercial, proprietary mildewcide or a solution prepared by mixing 1/3 cup of household detergent that contains no ammonia, 1 quart of 5 percent sodium hypochlorite bleach, and 3 quarts of warm water.

B. Adhesives: Wood adhesives for exterior exposure, with minimum 15- to 45-minute cure at 70 deg F, in gunnable and liquid formulations as recommended in writing by adhesive manufacturer for each type of repair.

- C. Fasteners: Use fastener metals that are noncorrosive and compatible with each material joined.
 - 1. Match existing fasteners in material and type of fastener unless otherwise indicated.
 - 2. Use concealed fasteners for interconnecting wood components.
 - 3. Use concealed fasteners for attaching items to other work unless exposed fasteners are the existing fastening method.
 - 4. For fastening metals, use fasteners of same basic metal as fastened metal unless otherwise indicated.
 - 5. For exposed fasteners, use Phillips-type machine screws of head profile flush with metal surface unless otherwise indicated.
 - 6. Finish exposed fasteners to match finish of metal fastened unless otherwise indicated.
- D. Anchors, Clips, and Accessories: Fabricate anchors, clips, and window accessories of aluminum, nonmagnetic stainless steel, or hot-dip zinc-coated steel complying with requirements in ASTM B 633 for SC 3 (Severe) service condition.

2.8 WOOD WINDOW FINISHES

- A. Unfinished Replacement Units: Provide exposed exterior and interior wood surfaces of replacement units unfinished; smooth, filled, and suitably prepared for on-site priming and finishing.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect adjacent materials from damage by historic treatment of wood windows.
- B. Clean wood windows of mildew, algae, moss, plant material, loose paint, grease, dirt, and other debris by scrubbing with bristle brush or sponge and detergent solution. Scrub mildewed areas with mildewcide. After cleaning, rinse thoroughly with fresh water. Allow to dry before repairing or painting.
- C. Condition replacement wood members and replacement units to prevailing conditions at installation areas before installing.

3.2 HISTORIC TREATMENT OF WOOD WINDOWS, GENERAL

- A. Historic Treatment Appearance Standard: Completed work is to have a uniform appearance as viewed by Architect from the window interior at 5 feet away and from the window exterior at 20 feet away.
- B. General: In treating historic items, disturb them as minimally as possible and as follows:
 - 1. Stabilize and repair wood windows to reestablish structural integrity and weather resistance while maintaining the existing form of each item.
 - 2. Remove coatings and apply borate preservative treatment before repair. Remove coatings according to Section 090391 "Historic Treatment of Plain Painting" unless otherwise indicated.

3. Repair items in place where possible.
 4. Install temporary protective measures to protect wood window work that is indicated to be completed later.
 5. Refinish historic wood windows according to Section 090391 "Historic Treatment of Plain Painting" unless otherwise indicated.
- C. Mechanical Abrasion: Where mechanical abrasion is needed for the work, use only the gentlest mechanical methods, such as scraping and natural-fiber bristle brushing, that will not abrade wood substrate, reducing clarity of detail. Do not use abrasive methods such as sanding, wire brushing, or power tools except as indicated as part of the historic treatment program and as approved by Architect.
- D. Repair and Refinish Existing Hardware: Dismantle window hardware; strip paint, repair, and refinish it to match finish samples; and lubricate moving parts just enough to function smoothly.
- E. Repair Wood Windows: Match existing materials and features, retaining as much original material as possible to perform repairs.
1. Unless otherwise indicated, repair wood windows by consolidating, patching, splicing, or otherwise reinforcing wood with new wood matching existing wood or with salvaged, sound, original wood.
 2. Where indicated, repair wood windows by limited replacement matching existing material.
 3. Sash Balance: Repair sash balances to function according to type as specified in "Hardware" Article" above. Provide missing sash balances.
- F. Replace Wood Units: Where indicated, duplicate and replace units with units made from salvaged, sound, original wood or with new wood matching existing wood. Use surviving prototypes to create patterns for duplicate replacements.
1. Do not use substitute materials unless otherwise indicated.
 2. Compatible substitute materials may be used.
- G. Protection of Openings: Where sash or windows are indicated for removal, cover resultant openings with temporary enclosures so that openings are weathertight during repair period.
- H. Identify removed windows, frames, sash, and members with numbering system corresponding to window locations to ensure reinstallation in same location. Key windows, sash, and members to Drawings showing location of each removed unit. Permanently label units in a location that will be concealed after reinstallation.

3.3 WOOD WINDOW PATCH-TYPE REPAIR

- A. General: Patch wood members that exhibit depressions, holes, or similar voids, and that have limited amounts of rotted or decayed wood.
1. Remove sash from windows before performing patch-type repairs at meeting or sliding surfaces unless otherwise indicated. Reglaze units before reinstallation.

2. Verify that surfaces are sufficiently clean and free of paint residue before patching.
 3. Treat wood members with wood consolidant before applying patching compound. Coat wood surfaces by brushing, applying multiple coats until wood is saturated and unable to absorb more. Allow treatment to harden before filling void with patching compound.
 4. Remove rotted or decayed wood down to sound wood.
- B. Apply wood-patching compound to fill depressions, nicks, cracks, and other voids created by removed or missing wood.
1. Prime patch area with application of wood consolidant or manufacturer's recommended primer.
 2. Mix only as much patching compound as can be applied according to manufacturer's written instructions.
 3. Apply patching compound in layers as recommended in writing by manufacturer until the void is completely filled.
 4. Sand patch surface smooth and flush with adjacent wood, without voids in patch material, and matching contour of wood member.
 5. Clean spilled compound from adjacent materials immediately.

3.4 WOOD WINDOW MEMBER-REPLACEMENT REPAIR

- A. General: Replace parts of or entire wood window members at locations indicated on Drawings and where damage is too extensive to patch.
1. Remove sash from windows before performing member-replacement repairs unless otherwise indicated.
 2. Verify that surfaces are sufficiently clean and free of paint residue before repair.
 3. Remove broken, rotted, and decayed wood down to sound wood.
 4. Custom fabricate new wood to replace missing wood; either replace entire wood member or splice new wood part into existing member.
 5. Secure new wood using finger joints, multiple dowels, or splines with adhesive and nailing to ensure maximum structural integrity at each splice. Use only concealed fasteners. Fill nail holes and patch surface to match surrounding sound wood.
- B. Repair remaining depressions, holes, or similar voids with patch-type repairs.
- C. Clean spilled materials from adjacent surfaces immediately.
- D. Glazing: Reglaze units before reinstallation.
1. Mill new and rout existing glazed members to accommodate new glass thickness.
 2. Provide replacement glazing stops coordinated with glazing system indicated.
 3. Provide glazing stops to match contour of sash frames.
- E. Reinstall units removed for repair into original openings.
- F. Weather Stripping: Replace nonfunctioning and install missing weather stripping to ensure full-perimeter and meeting rail weather stripping for each operable sash.

3.5 GLAZING

- A. Comply with combined written instructions of manufacturers of glass, glazing systems, and glazing materials, unless more stringent requirements are indicated.
- B. Remove cracked and damaged glass and glazing materials from openings and prepare surfaces for reglazing.
- C. Remove existing glass and glazing where indicated on Drawings, and prepare surfaces for reglazing.
- D. Remove glass and glazing from openings and prepare surfaces for reglazing.
- E. Size glass as required by Project conditions to provide necessary bite on glass, minimum edge and face clearances, with reasonable tolerances.
- F. Apply primers to joint surfaces where required for adhesion of glazing system, as determined by preconstruction testing.
- G. Install setting bead, side beads, and back bead against stop in glazing rabbets before setting glass.
- H. Install glass with proper orientation so that coatings, if any, face exterior or interior as required.
- I. Install glazing points.
- J. Disposal of Removed Glass: Protect unbroken lites and deliver as salvage to Owner for storage where directed unless otherwise indicated.

3.6 WEATHER STRIPPING INSTALLATION

- A. Install weather stripping for tight seal of joints as determined by preconstruction testing and demonstrated in mockup.

3.7 FIELD QUALITY CONTROL

- A. Manufacturers Field Service: Engage wood-repair-material manufacturers' factory-authorized service representatives for consultation and Project-site inspection and to provide on-site assistance when requested by Architect.

3.8 ADJUSTING

- A. Adjust existing and replacement operating sash, screens, hardware, weather stripping, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

3.9 CLEANING AND PROTECTION

- A. Protect window surfaces from contact with contaminating substances resulting from construction operations. Monitor window surfaces adjacent to and below exterior concrete and masonry during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances contact window surfaces, remove contaminants immediately.
- B. Clean exposed surfaces immediately after historic treatment of wood windows. Avoid damage to coatings and finishes. Remove excess sealants, glazing and patching materials, dirt, and other substances.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction

END OF SECTION 080352

SECTION 081433 - STILE AND RAIL WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior stile and rail wood doors.
2. Interior stile and rail wood doors.
3. Priming Finishing stile and rail wood doors.
4. Fitting stile and rail wood doors to frames and machining for hardware.
5. Prehanging doors in frames.

B. Related Requirements:

1. Section 064214 "Stile and Rail Wood Paneling" for requirements for veneers from the same flitches for both wood paneling and stile and rail wood doors.
2. Section 099123 "Interior Painting" and Section 090391 "Historic Treatment of Plain Painting" for field finishing stile and rail doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include details of construction and glazing.
2. Include factory-finishing specifications.

B. Shop Drawings: For stile and rail wood doors. Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data, including those for stiles, rails, panels, and moldings (sticking); and other pertinent data, including the following:

1. Dimensions of doors for factory fitting.
2. Locations and dimensions of mortises and holes for hardware.
3. Undercuts.
4. Requirements for veneer matching.
5. Doors to be factory finished and finish requirements.
6. Fire-protection ratings for fire-rated doors.

C. Samples for Initial Selection: For factory-finished doors.

D. Samples for Verification: Corner sections of doors, approximately 8 by 10 inches, with door faces and edgings representing typical range of color and grain for each species of veneer and solid lumber required. Finish Sample with same materials proposed for factory-finished doors.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of door, from manufacturer.
- B. Sample Warranty: For special warranty.
- C. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body and is a certified participant in AWI's Quality Certification Program.
- B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in opaque plastic bags or cardboard cartons.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.
- B. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during remainder of construction period.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship, or have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section, within specified warranty period.
 - 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 2. Warranty shall be in effect during the following period of time from date of Substantial Completion:
 - a. Exterior Doors: Five years.
 - b. Interior Doors: Five years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of stile and rail wood door from single manufacturer.

2.2 MATERIALS

- A. General: Use only materials that comply with referenced standards and other requirements specified.
1. Assemble exterior doors and sidelites, including components, with wet-use adhesives complying with ASTM D 5572 for finger joints and with ASTM D 5751 for joints other than finger joints.
 2. Assemble interior doors, including components, with either dry-use or wet-use adhesives complying with ASTM D 5572 for finger joints and with ASTM D 5751 for joints other than finger joints.
- B. Regional Materials: Stile and rail wood doors shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- C. Regional Materials: Stile and rail wood doors shall be manufactured within 500 miles of Project site.
- D. Certified Wood: Stile and rail wood doors shall be certified as "FSC Pure" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification."
- E. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.
- F. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- G. Panel Products: Any of the following unless otherwise indicated:
1. Veneer-core plywood, made with adhesive containing no urea-formaldehyde.
- H. Safety Glass: Provide products complying with testing requirements in 16 CFR 1201, for Category II materials, unless those of Category I are expressly indicated and permitted.

2.3 EXTERIOR STILE AND RAIL WOOD DOORS

- A. Thermal Transmittance: Maximum whole fenestration product U-factor of 0.35,, according to AAMA 1503, ASTM E 1423, or NFRC 100.
- B. Exterior Stile and Rail Wood Doors: Exterior stock doors complying with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards," and with other requirements specified.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Algoma Hardwoods, Inc.
 - b. Artistic Doors and Windows, Inc.
 - c. Belentry Doors LLC.
 - d. Dimension Millworks.
 - e. Eggers Industries.
 - f. Enjo Architectural Millwork.
 - g. Harring Doors.
 - h. Maiman Company (The).
 - i. Marshfield DoorSystems, Inc.
 - j. Pincrest Inc.
 - k. Select Door.
 - l. Sun-Dor-Co.
 - m. VT Industries, Inc.
 - n. Woodtech Trading Company.
 - o. Or Approved Equal.
3. Panel Designs: Indicated on Drawings. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
4. Grade: Premium.
5. Finish: Opaque typical exterior door and exterior of Carriage House door/ Stain with Acrylic Water-Based Top Coat (interior of Carriage House)
6. Wood Species and Cut for Transparent Finish: Idaho white, lodgepole, ponderosa, or sugar pine, plain sawed/sliced.
7. Door Construction for Opaque Finish:
 - a. Stile and Rail Construction: Clear softwood; may be edge glued for width and finger jointed.
8. Stile and Rail Widths: As indicated or Manufacturer's standard, but not less than the following:
 - a. Stiles, Top and Intermediate Rails: As indicated on Drawings.
 - b. Bottom Rails: As indicated on Drawings.
9. Panels: Varied, as indicated on Drawings.
10. Molding Profile (Sticking): As selected by Architect from manufacturer's full range.
11. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.
12. Mark, label, or otherwise identify stile and rail wood doors as complying with WDMA I.S.6A and grade specified.

NOTE: The Carriage House Door shall be thermal-insulated as shown on Drawings.

2.4 INTERIOR STILE AND RAIL WOOD DOORS

- A. Interior Stile and Rail Wood Doors: Interior doors complying with WDMA I.S.6, "Industry Standard for Wood Stile and Rail Doors," and with other requirements specified.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Trustile Doors (www.trustile.com);
 - b. Uber Doors (www.uberdoors.com);

- c. Karona, Inc. (www.karonadoor.com);
- d. Or Approved Equal.
2. WDMA Design Group: 1-3/8 Interior Panel Doors.
 - a. Panel Design: As shown on Drawings.
3. Finish and Grade: Opaque and Standard.
4. Wood Species: Idaho white, lodgepole, ponderosa, or sugar pine.
5. Stile and Rail Construction: Edge-glued solid lumber.
6. Raised-Panel Construction: Edge-glued solid lumber.
7. Raised-Panel Thickness: As indicated.
8. Flat-Panel Thickness: As indicated.
9. Molding Profile (Sticking): As selected by Architect from manufacturer's full range.
10. Mark, label, or otherwise identify stile and rail wood doors as complying with WDMA I.S.6 and grade specified. Include panel design number if applicable.

2.5 STILE AND RAIL WOOD DOOR FABRICATION

- A. Fabricate stile and rail wood doors in sizes indicated for field fitting.
- B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels unless otherwise indicated:
 1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/2 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide not more than 3/8 inch from bottom of door to top of threshold.
 - a. Comply with NFPA 80 for fire-rated doors.
 2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
 3. Bevel fire-rated doors 1/8 inch in 2 inches on lock edge; trim stiles and rails only to extent permitted by labeling agency.
- C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- D. Glazed Openings: Trim openings indicated for glazing with solid wood moldings, with one side removable. Miter wood moldings at corner joints.
- E. Glazed Openings: Factory install glazing in doors, complying with Section 088000 "Glazing." Install glass using manufacturer's standard elastomeric glazing sealant complying with ASTM C 920. Secure glass in place with removable wood moldings. Miter wood moldings at corner joints.
- F. Exterior Doors: Factory treat exterior doors after fabrication with water-repellent preservative to comply with WDMA I.S.4. Flash top of outswinging doors with manufacturer's standard metal flashing.
- G. Prehung Doors: Provide stile and rail doors complete with frames, weather stripping, and hardware.
 1. Provide wood door frames that comply with Section 062023 "Interior Finish Carpentry."
 2. Provide hardware, including weather stripping, that complies with Section 087100 "Door Hardware."

2.6 SHOP PRIMING

- A. Doors for Opaque Finish: Shop prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer specified in Section 099113 "Exterior Painting."
- B. Doors for Transparent Finish: Shop prime faces and all four edges with stain (if required), other required pretreatments, and first coat of finish as specified in Section 099300 "Staining and Transparent Finishing." Seal edges of cutouts and mortises with first coat of finish.

2.7 FINISHING

- A. Finish wood doors at factory or woodworking shop.
- B. For doors indicated to be factory or shop finished, comply with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards," and with other requirements specified.
 - 1. Finish faces and all four edges of doors, including mortises and cutouts. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.
- C. Use only paints and coatings that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Opaque Finish:
 - 1. Grade: Premium.
 - 2. Finish: Painted finish per painting specifications for new wood interior and exterior.
 - 3. Color: As selected by Architect from manufacturer's full range.
 - 4. Sheen: Semigloss.
- E. Transparent Finish:
 - 1. Grade: Premium.
 - 2. Finish: Acrylic-water based top coat at new wood of interior carriage door.
 - 3. Stain: As selected by Architect from manufacturer's full range.
 - 4. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames, with Installer present, before hanging doors.
 - 1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
Connolly & Hickey Historical Architects, LLC
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- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
 - 1. Install fire-rated doors according to NFPA 80.
 - 2. Install smoke- and draft-control doors according to NFPA 105.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
 - 1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - a. Comply with NFPA 80 for fire-rated doors.
 - 2. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
 - 3. Bevel fire-rated doors 1/8 inch in 2 inches on lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- E. Factory or Shop-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081433

SECTION 081613 - FIBERGLASS DOORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Fiberglass Entrance Doors, and Sidelites
 2. Pre-hung Hardwood Systems
 3. Glazing

1.2 REFERENCES

- A. American Architectural Manufacturer Association (AAMA)
1. AAMA 1304; Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems.
- B. ASTM International
1. ASTM E283; Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 2. ASTM E330; Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Pressure Difference.
 3. ASTM E331; Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 4. ASTM E547; Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference.
- C. National Fenestration Rating Council (NFRC)
1. NFRC 100; Procedure for Determining Fenestration Thermal Properties.
 2. NFRC 200; Solar Heat Gain Coefficient and Visible Transmittance.

1.3 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
- B. Shop Drawings:
1. Submit shop drawings indicating details of construction, flashings and relationship with adjacent construction.
- C. Samples for Verification: For each factory-finished product specified, two samples, minimum size 6 inches (152 mm) square, representing actual finishes.
- D. Quality Assurance Submittals:
1. Design Data, Test Reports: Provide manufacturer test reports indicating product compliance with indicated requirements.

2. Manufacturer Instructions: Provide manufacturer's written installation instructions.

E. Closeout Submittals: Refer to Section 01 70 00 Execution and Closeout Requirements Closeout Submittals.

1.4 QUALITY ASSURANCE

A. Qualifications:

1. Installer Qualifications: the installer has sufficient knowledge of installing the product for the size and scope of the project.
2. Certifications: NAMI certification label indicating assemblies meet the design requirements.

1.5 MOCKUPS: Provide a mock-up for evaluation of installation techniques and workmanship.

1. Mock-ups shall incorporate surrounding construction, including wall assembly fasteners, flashing, and other related accessories installed in accordance with manufacturer's approved installation methods.
2. Do not proceed with remaining work until workmanship is approved by Architect.
3. Rework mock-up as required to produce acceptable work.
4. At Substantial Completion, approved mockups may become part of completed Work.
5. Demolish mockups and remove from site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations and industry standards.

B. Deliver and store assembly materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.

1. Protect doors from weather and exposure to direct sunlight prior to installation, exposure of machined doors may compromise the internal reinforced material of the door.
2. Store in a dry, well-ventilated area off the floor, in a humidity and temperature-controlled facility. Recommended conditions: 30 to 50 percent relative humidity and 50 to 90 degrees F (10 to 32 degrees C).
3. During storage, do not remove paper or cardboard placed between products for shipment.

C. Handling: Handle with clean hands and equipment. Lift and carry the products when moving them. Do not drag across one another.

D. For optimal performance, new primed or unfinished products should be finished or painted with an even number of coats on all six sides as soon as possible after installation. Finishing is necessary because by nature, door construction materials are susceptible to the elements and changes in moisture levels can cause damage. Painting and finishing seals the surfaces, maintains, protects and enhances the beauty of the product by keeping it less susceptible to debris and easier to clean. Keeping doors properly finished is the first step in effective maintenance.

1.7 FIELD CONDITIONS

- A. Maintain environmental conditions; temperature, humidity, and ventilation, within limits recommended by manufacturer for optimum results. Install only in vertical walls and when conditions are dry. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 WARRANTY

- A. Manufacturer's Standard Warranty: Assemblies will be free from defects in materials and workmanship from the date of manufacture for the time periods indicated below:
 - 1. Door Slab:
 - a. Commercial: 5 years.
 - b. Door Frame: 1 year.
 - c. Factory Prefinish: 1 year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. JELD-WEN, Inc.;
 - 2. [Kolbe Windows & Doors](#).
 - 3. [Pella Corporation \(Basis of Design\)](#)
 - 4. [Or Approved Equal](#).

2.2 FIBERGLASS ENTRANCE DOORS, AND SIDELITES.

- A. Wood clad doors with architectural fiberglass.
 - 1. Door:
 - a. Smooth Paint Surface:
 - 1) Paneled and Clear Glass (Tempered w/Simulated Divided Lites/Grill Between Glass)
 - 2. Sidelites/Full Doors:
 - a. Smooth Paint Surface:
 - 1) Paneled and Clear Glass Doors (Tempered w/Simulated Divided Lites/Grill Between Glass)].
- B. Structural Requirements – Provide doors capable of complying with requirements indicated:
 - 1. Design pressure: 75 lbs/sf.
 - 2. As indicated on drawings.
- C. Impact (Windborne-Debris) Resistance
 - 1. Doors capable of resisting impact from windborne debris, when tested in accordance with ASTM E1886 and ASTM E1996.
- D. NFRC Requirements – Provide doors capable of complying with the following total door ratings:
 - 1. U-Factor: .20 or greater in accordance with NFRC 100.
 - 2. Solar Heat Gain Coefficient (SHGC): .20 or greater in accordance with NFRC 200.
- E. Thickness: 1-3/4 inch (Standard) for average height/ 2-1/4 inch for 9 foot tall doors.

FIBERGLASS DOORS

Restoration and Expansion
Historic Metlar-Bodine House
Piscataway, Middlesex County, NJ
Architects Project No.: 1836C

- F. Door Style: Glass.
- G. Door Shape: Squared Top.
 - a. Panels per Face: One.
 - b. Top Panel Shape(s): Squared.
 - c. Lites: Simulated Divided/Grill Between Glass (SDL/GBG).
- H. Hardware: None. Prep door for owner supplied hinge and lockset.
- I. Hardware
 - 1. Entry Locksets: Refer to Drawings.
 - a. Exterior escutcheon plate
 - b. Mortise lock
 - c. Interior escutcheon plate
 - d. Interior operator: Lever.
 - 2. Finish: As selected by Architect.

2.3 PREHUNG HARDWOOD SYSTEMS

- A. Profile: System 01, Single Door with Multiple Fixed Doors/Sidelights – Refer to Drawings.
- B. Jamb: Primed White Solid Pine.
 - 1. Width: As selected by Architect.
 - 2. Profile: Rabbeted.
- C. Casing: As selected by Architect.
- D. Hinges: Solid brass concealed-bearing.
 - 1. Size: 4 x 4 Radius - Radius.
 - 2. Finish: Oil-Rubbed Bronze.
- E. Sills: Aluminum with Polished Aluminum Finish.

2.4 GLAZING

- A. Glass Type:
 - 1. Clear Glass: Low E.
- B. Caming Type: Patina.
- C. Lite Frame type: Screw Together
- D. Sidelite Glazing Shape: Full-View.

2.5 CONSTRUCTION ACCESSORIES

- A. Flashing: Refer to Sheet Metal Flashing and Trim and Manufacturer's Requirements.

- B. Sealants: Refer to Section 079200 - Joint Sealants.
- C. Sealants: Manufacturer recommended sealants to maintain watertight conditions.

2.6 Fabrication

- A. Skins are adhered to engineered wood frames with core materials and bonding agents that permanently lock skin to frame.

2.7 FINISHES

- A. Smooth Surface:
 - 1. Paint Grade: Artic White

PART 3 - EXECUTION

3.1 GENERAL

- A. Install doors in accordance with manufacturer's installation guidelines and recommendations.

3.2 EXAMINATION

- A. Inspect door prior to installation.
- B. Inspect rough opening for compliance with door manufacturer recommendations. Verify rough opening conditions are within recommended tolerances.

3.3 INSTALLATION

- A. Install jamb assembly.
 - 1. Caulk sill along outside edge and ½ inch in from edge of subfloor.
 - 2. Set door unit into center of opening and tack in place.
 - 3. Shim hinge then latch side jambs straight. Inspect jamb for square, level and plumb.
 - 4. Shim and fasten top of unit where sidelite joins door jamb.
 - 5. Fasten hinge side jamb to studs.
 - 6. Verify door opens freely and weatherstrip meets door evenly.
 - 7. Verify door sweep contacts threshold evenly.
 - 8. Fasten latch side jamb to studs.
- B. Caulk outside perimeter of door unit between brickmould and wall face, along front side of threshold, and between jamb sides and threshold.

3.4 PROTECTION

- A. Protect installed doors from damage.

END OF SECTION

SECTION 085413 - FIBERGLASS WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes fiberglass-framed windows.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **[Project site]** <Insert location>.
 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 2. Review, discuss, and coordinate the interrelationship of fiberglass windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
 3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
 4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for fiberglass windows.
- B. Shop Drawings: For fiberglass windows.
 1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Samples: For each exposed product and for each color specified, 2 by 4 inches in size.
- D. Samples for Initial Selection: For units with factory-applied finishes.
 1. Include Samples of hardware and accessories involving color selection.
- E. Samples for Verification: For fiberglass windows and components required, prepared on Samples of size indicated below:
 1. Exposed Finishes: 2 by 4 inches.
 2. Exposed Hardware: Full-size units.

F. Product Schedule: For fiberglass windows. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Product Test Reports: For each type of fiberglass window, for tests performed by a qualified testing agency.
- C. Field quality-control reports.
- D. Sample Warranties: For manufacturer's warranties.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating fiberglass windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.
- B. Installer Qualifications: An installer acceptable to fiberglass window manufacturer for installation of units required for this Project.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace fiberglass windows that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, and air infiltration.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of materials and finishes beyond normal weathering.
 - e. Failure of insulating glass.
 - 2. Warranty Period:
 - a. Window: 10 years from date of Substantial Completion.
 - b. Glazing Units: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain fiberglass windows from single source from single manufacturer.

2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
1. Window Certification: WDMA certified with label attached to each window.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
1. Minimum Performance Class: LC.
 2. Minimum Performance Grade: 25.
- C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.35 Btu/sq. ft. x h x deg F or greater.
- D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.30 or greater.
- E. Sound Transmission Class (STC): Rated for not less than 26 STC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E413.
- F. Outside-Inside Transmission Class (OITC): Rated for not less than 26 OITC when tested for laboratory sound transmission loss according to ASTM E90 and determined by ASTM E1332.
- G. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone 2 for basic protection.

2.3 FIBERGLASS WINDOWS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. [Fibertec Window and Door Manufacturing](#).
 2. [Kolbe Windows & Doors](#).
 3. [Pella Corporation](#).
- B. Operating Types: Provide the following operating types in locations indicated on Drawings:
1. Double hung.
- C. Frames and Sashes: Pultruded fiberglass complying with AAMA/WDMA/CSA 101/I.S.2/A440 and with exposed exterior fiberglass surfaces finished with manufacturer's standard enamel coating complying with AAMA 613.
1. Exterior Color: As selected by Architect from manufacturer's full range.

2. Interior Finish: In color selected by Architect from manufacturer's full range.
- D. Glass: Clear annealed glass, ASTM C1036, Type 1, Class 1, q3.
1. Kind: Fully tempered where indicated on Drawings.
- E. Insulating-Glass Units: ASTM E2190.
1. Glass: ASTM C1036, Type 1, Class 1, q3.
 - a. Tint: Clear.
 - b. Kind: Fully tempered where indicated on Drawings.
 2. Lites: See Drawings.
 3. Filling: Fill space between glass lites with air.
 4. Low-E Coating: Sputtered on second or third surface.
- F. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.
- G. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock fiberglass windows, and sized to accommodate sash weight and dimensions.
1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.
- H. Hung Window Hardware:
1. Counterbalancing Mechanism: Complying with AAMA 902, concealed, of size and capacity to hold sash stationary at any open position.
 2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only. Provide custodial locks.
 3. Tilt Hardware: Releasing tilt latch allows sash to pivot about horizontal axis to facilitate cleaning exterior surfaces from the interior.
- I. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- J. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 ACCESSORIES

- A. Dividers (False Muntins): Provide divider grilles in designs indicated for each sash lite.
1. Quantity and Type: Two per sash, removable from exposed surfaces of interior and permanently located at exterior lite and spacer bar between the glass lites.
 2. Material: Manufacturer's standard.
 3. Pattern: As indicated on Drawings.
 4. Profile: As selected by Architect from manufacturer's full range.
 5. Color: As selected by Architect from manufacturer's full range.

2.5 INSECT SCREENS

- A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.
 - 1. Type and Location: Full, outside for double-hung sashes.
- B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
 - 1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.
 - 2. Finish for Interior Screens: Baked-on organic coating in color selected by Architect from manufacturer's full range.
 - 3. Finish for Exterior Screens: Baked-on organic coating in color selected by Architect from manufacturer's full range <Insert finish>.
- C. Glass-Fiber Mesh Fabric: 18-by-14 or 18-by-16 mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D3656/D3656M.
 - 1. Mesh Color: Manufacturer's standard.
 - 2. Wire-Fabric Finish: [Natural bright] [Charcoal gray] [Black] <Insert finish>.

2.6 FABRICATION

- A. Fabricate fiberglass windows in sizes indicated. Include a complete system for installing and anchoring windows.
- B. Glaze fiberglass windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Mullions: Provide mullions and cover plates, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units.
- E. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E2112.
- B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

3.3 FIELD QUALITY CONTROL

- A. Testing Services: Testing and inspecting of installed windows shall take place as follows:
 - 1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502.
 - 2. Air-Infiltration Testing:
 - a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.
 - b. Allowable Air-Leakage Rate: 1.5 times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.
 - 3. Water-Resistance Testing:
 - a. Test Pressure: Two-thirds times test pressure required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance grade indicated.
 - b. Allowable Water Infiltration: No water penetration.
 - 4. Testing Extent: Three windows of each type as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested after perimeter sealants have cured.
 - 5. Test Reports: Prepared according to AAMA 502.
- B. Windows will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- B. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.

1. Keep protective films and coverings in place until final cleaning.
- C. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 085413

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Mechanical door hardware for the following:
 - a. Swinging doors.
2. Cylinders for door hardware specified in other Sections.

B. Related Requirements:

1. Section 064113 "Wood-Veneer-Faced Architectural Cabinets" for cabinet door hardware provided with cabinets.
2. Section 081213 "Hollow Metal Frames" for astragals provided as part of labeled fire-rated assemblies and for door silencers provided as part of hollow-metal frames.
3. Section 081433 "Stile and Rail Wood Doors" for astragals and integral intumescent seals provided as part of labeled fire-rated assemblies.
4. Section 081613 "Fiberglass Doors".

1.3 COORDINATION

- A. Floor-Recessed Door Hardware: Coordinate layout and installation with floor construction.
 1. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

- B. Keying Conference: Conduct conference at Project site.
 - 1. Incorporate conference decisions into keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 - a. Flow of traffic and degree of security required.
 - b. Preliminary key system schematic diagram.
 - c. Requirements for key control system.
 - d. Requirements for access control.
 - e. Address for delivery of keys.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples: For each exposed product in each finish specified, in manufacturer's standard size.
 - 1. Tag Samples with full product description to coordinate Samples with door hardware schedule.
- C. Samples for Initial Selection: For each type of exposed finish.
- D. Samples for Verification: For each type of exposed product, in each finish specified.
 - 1. Sample Size: Full-size units or minimum 2-by-4-inch Samples for sheet and 4-inch long Samples for other products.
 - a. Full-size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.
 - 2. Tag Samples with full product description to coordinate Samples with door hardware schedule.
- E. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
 - 2. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
 - 3. Content: Include the following information:
 - a. Identification number, location, hand, fire rating, size, and material of each door and frame.
 - b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - d. Fastenings and other installation information.
 - e. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.

- f. Mounting locations for door hardware.
 - g. List of related door devices specified in other Sections for each door and frame.
- F. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For [Installer] [and] [Architectural Hardware Consultant].
- B. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
- C. Field quality-control reports.
- D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals.
- B. Schedules: Final door hardware and keying schedule.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and of an Architectural Hardware Consultant who is available during the course of the Work to consult Contractor, Architect, and Owner about door hardware and keying.
 - 1. Warehousing Facilities: In Project's vicinity.
 - 2. Scheduling Responsibility: Preparation of door hardware and keying schedule.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

- C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- D. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: Three years from date of Substantial Completion unless otherwise indicated below:
 - a. Exit Devices: Two years from date of Substantial Completion.
 - b. Manual Closers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of door hardware from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
- B. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that complies with requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
 - 1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg of water.
- C. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- D. Accessibility Requirements: For door hardware on doors in an accessible route, comply with [the DOJ's "2010 ADA Standards for Accessible Design"] [the DOT's "ADA Standards for Transportation Facilities"] [the ABA standards of the Federal agency having jurisdiction] [ICC A117.1] [HUD's "Fair Housing Accessibility Guidelines"] [and] <Insert regulation>.
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
 - 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.

- b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.
5. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

2.3 SCHEDULED DOOR HARDWARE

- A. Provide products for each door that comply with requirements indicated in Part 2 and door hardware schedule.
 1. Door hardware is scheduled on Drawings.

2.4 HINGES

- A. Hinges: BHMA A156.1.[Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.]
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Baldwin Hardware Corporation.
 - b. Hager Companies.
 - c. Stanley Commercial Hardware; a division of Stanley Security Solutions.

2.5 SELF-CLOSING HINGES AND PIVOTS

- A. Self-Closing Hinges and Pivots: BHMA A156.17.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allegion plc.
 - b. Hager Companies.
 - c. Stanley Commercial Hardware; a division of Stanley Security Solutions.

2.6 CENTER-HUNG AND OFFSET PIVOTS

- A. Center-Hung and Offset Pivots: BHMA A156.4.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allegion plc.
 - b. Architectural Builders Hardware Mfg., Inc.
 - c. Hager Companies.

2.7 CONTINUOUS HINGES

- A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch-thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.
- B. Pin-and-Barrel-Type Hinges:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allegion plc.
 - b. Architectural Builders Hardware Mfg., Inc.
 - c. Hager Companies.
 - d. Stanley Commercial Hardware; a division of Stanley Security Solutions.
- C. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allegion plc.
 - b. Architectural Builders Hardware Mfg., Inc.
 - c. Hager Companies.
 - d. Pemko; an ASSA ABLOY Group Company.
 - e. Stanley Commercial Hardware; a division of Stanley Security Solutions.

2.8 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
1. Bored Locks: Minimum 1/2-inch latchbolt throw.
 2. Mortise Locks: Minimum 3/4-inch latchbolt throw.
 3. Deadbolts: Minimum 1.25-inch bolt throw.
- C. Lock Backset: 2-3/4 inches unless otherwise indicated.
- D. Lock Trim:
1. Description: As indicated on Drawings.
 2. Levers: Wrought.
 3. Escutcheons (Roses): Wrought.
 4. Dummy Trim: Match lever lock trim and escutcheons.

- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 3. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.
 4. Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.
- F. Bored Locks: BHMA A156.2; Grade 1; Series 4000.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allegion plc.
 - b. Best Access Systems; Stanley Security Solutions, Inc.
 - c. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
 - d. Hager Companies.
 - e. SARGENT Manufacturing Company; ASSA ABLOY.
 - f. Stanley Commercial Hardware; a division of Stanley Security Solutions.
- G. Mortise Locks: BHMA A156.13; Operational Grade 1; stamped steel case with steel or brass parts; Series 1000.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Accurate Lock & Hardware Co.
 - b. Best Access Systems; Stanley Security Solutions, Inc.
 - c. Corbin Russwin, Inc.; an ASSA ABLOY Group company.
 - d. Hager Companies.
 - e. SARGENT Manufacturing Company; ASSA ABLOY.
 - f. Stanley Commercial Hardware; a division of Stanley Security Solutions.
- H. Interconnected Locks: BHMA A156.12; Grade 1; Series 5000.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allegion plc.
 - b. Hager Companies.
 - c. Stanley Commercial Hardware; a division of Stanley Security Solutions.
- I. Roller Latches: BHMA A156.16; Grade 1; rolling plunger that engages socket or catch, with adjustable roller projection.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allegion plc.
 - b. Architectural Builders Hardware Mfg., Inc.
 - c. Baldwin Hardware Corporation.
 - d. Rockwood Manufacturing Company; an ASSA ABLOY Group company.

2.9 AUXILIARY LOCKS

A. Bored Auxiliary Locks: BHMA A156.36: Grade 1; with strike that suits frame.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allegion plc.
 - b. Best Access Systems; Stanley Security Solutions, Inc.
 - c. Hager Companies.
 - d. SARGENT Manufacturing Company; ASSA ABLOY.
 - e. Stanley Commercial Hardware; a division of Stanley Security Solutions.

B. Mortise Auxiliary Locks: BHMA A156.36; Grade 1; with strike that suits frame.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.
 - b. Allegion plc.
 - c. Best Access Systems; Stanley Security Solutions, Inc.
 - d. Hager Companies.
 - e. SARGENT Manufacturing Company; ASSA ABLOY.
 - f. Stanley Commercial Hardware; a division of Stanley Security Solutions.

C. Narrow Stile Auxiliary Locks: BHMA A156.36; Grade 1; with strike that suits frame.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Accurate Lock & Hardware Co.
 - b. Adams Rite Manufacturing Co; an ASSA ABLOY Group company.

2.10 EXIT LOCKS AND EXIT ALARMS

A. Exit Locks and Alarms: BHMA A156.29, Grade 1.

2.11 AUTOMATIC AND SELF-LATCHING FLUSH BOLTS

- A. Automatic Flush Bolts: BHMA A156.3, Type 25; minimum 3/4-inch throw; with dust-proof strikes; designed for mortising into door edge. Include wear plates.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Allegion plc.](#)
 - b. [Door Controls International, Inc.](#)
 - c. [Trimco.](#)
- B. Self-Latching Flush Bolts: BHMA A156.3, Type 27; minimum 3/4-inch throw; with dust-proof strikes; designed for mortising into door edge. Include wear plates.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Allegion plc.](#)
 - b. [Burns Manufacturing Incorporated.](#)
 - c. [Door Controls International, Inc.](#)
 - d. [Trimco.](#)

2.12 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: BHMA A156.3.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Allegion plc.](#)
 - b. [Corbin Russwin, Inc.; an ASSA ABLOY Group company.](#)
 - c. [Hager Companies.](#)
 - d. [SARGENT Manufacturing Company; ASSA ABLOY.](#)
 - e. [Stanley Commercial Hardware; a division of Stanley Security Solutions.](#)

2.13 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver. Provide cylinder from same manufacturer of locking devices.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Allegion plc.](#)
 - b. [ASSA, Inc.](#)
 - c. [Best Access Systems; Stanley Security Solutions, Inc.](#)

- d. [Corbin Russwin, Inc.; an ASSA ABLOY Group company.](#)
 - e. [Hager Companies.](#)
 - f. [SARGENT Manufacturing Company; ASSA ABLOY.](#)
 - g. [Stanley Commercial Hardware; a division of Stanley Security Solutions.](#)
- B. Standard Lock Cylinders: BHMA A156.5; Grade 1 permanent cores; face finished to match lockset.
- 1. Core Type: Interchangeable.
- C. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.
- D. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.14 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock. Incorporate decisions made in keying conference.
- 1. Existing System:
 - a. Master key or grand master key locks to Owner's existing system.
 - b. Re-key Owner's existing master key system into new keying system.
 - 2. Keyed Alike: Key all cylinders to same change key.
- B. Keys: Nickel silver.
- 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:

2.15 ACCESSORIES FOR PAIRS OF DOORS

- A. Coordinators: BHMA A156.3; consisting of active-leaf, hold-open lever and inactive-leaf release trigger; fabricated from steel with nylon-coated strike plates; with built-in, adjustable safety release.
- B. Carry-Open Bars: BHMA A156.3; prevent the inactive leaf from opening before the active leaf; provide polished brass or bronze carry-open bars with strike plate for inactive leaves of pairs of doors unless automatic or self-latching bolts are used.
- C. Astragals: BHMA A156.22.

2.16 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Allegion plc.](#)
 - b. [Corbin Russwin, Inc.; an ASSA ABLOY Group company.](#)
 - c. [Hager Companies.](#)
 - d. [SARGENT Manufacturing Company; ASSA ABLOY.](#)
 - e. [Stanley Commercial Hardware; a division of Stanley Security Solutions.](#)

2.17 CLOSER HOLDER RELEASE DEVICES

- A. Closer Holder Release Devices: BHMA A156.15; Grade 1; closer connected with separate or integral releasing and fire- or smoke-detecting devices. Door shall become self-closing on interruption of signal to release device. Automatic release is activated by loss of power.
 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Allegion plc.](#)
 - b. [Corbin Russwin, Inc.; an ASSA ABLOY Group company.](#)
 - c. [Norton Door Controls; an ASSA ABLOY Group company.](#)
 - d. [SARGENT Manufacturing Company; ASSA ABLOY.](#)
 - e. [Stanley Commercial Hardware; a division of Stanley Security Solutions.](#)

2.18 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: BHMA A156.16.
 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Allegion plc.](#)
 - b. [Architectural Builders Hardware Mfg., Inc.](#)
 - c. [Baldwin Hardware Corporation.](#)
 - d. [Hager Companies.](#)
 - e. [Rockwood Manufacturing Company; an ASSA ABLOY Group company.](#)
 - f. [Trimco.](#)

2.19 OVERHEAD STOPS AND HOLDERS

- A. Overhead Stops and Holders: BHMA A156.8.
 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Allegion plc.](#)
 - b. [Architectural Builders Hardware Mfg., Inc.](#)

- c. [Hager Companies.](#)
- d. [SARGENT Manufacturing Company; ASSA ABLOY.](#)

2.20 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
 - 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Hager Companies.](#)
 - b. [Legacy Manufacturing.](#)
 - c. [Pemko; an ASSA ABLOY Group Company.](#)
- B. Maximum Air Leakage: When tested according to ASTM E283 with tested pressure differential of 0.3-inch wg, as follows:
 - 1. Smoke-Rated Gasketing: 0.3 cfm/sq. ft. of door opening.
 - 2. Gasketing on Single Doors: 0.3 cfm/sq. ft. of door opening.
 - 3. Gasketing on Double Doors: 0.50 cfm per foot of door opening.

2.21 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
 - 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Hager Companies.](#)
 - b. [Pemko; an ASSA ABLOY Group Company.](#)
 - c. [Rixson Specialty Door Controls; an ASSA ABLOY Group company.](#)

2.22 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch-thick aluminum; with manufacturer's standard machine or self-tapping screw fasteners.
 - 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Allegion plc.](#)
 - b. [Burns Manufacturing Incorporated.](#)
 - c. [Hager Companies.](#)
 - d. [Rockwood Manufacturing Company; an ASSA ABLOY Group company.](#)
 - e. [Trimco.](#)

2.23 PLASTIC PROTECTION PLATES

- A. Plastic Protection Plates: BHMA A156.6; fabricated with four sides beveled; plastic laminate; 1/8 inch thick; NEMA LD 3, Grade HGS.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allegion plc.
 - b. Burns Manufacturing Incorporated.
 - c. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
 - d. Trimco.

2.24 AUXILIARY DOOR HARDWARE

- A. Auxiliary Hardware: BHMA A156.16.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allegion plc.
 - b. Baldwin Hardware Corporation.
 - c. Hager Companies.
 - d. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
 - e. Trimco.

2.25 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rating labels and as otherwise approved by Architect.
1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
- C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.
1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the

door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

2. Fire-Rated Applications:
 - a. Wood or Machine Screws: For the following:
 - 1) Hinges mortised to doors or frames[; **use threaded-to-the-head wood screws for wood doors and frames**].
 - 2) Strike plates to frames.
 - 3) Closers to doors and frames.
 - b. Steel Through Bolts: For the following unless door blocking is provided:
 - 1) Surface hinges to doors.
 - 2) Closers to doors and frames.
 - 3) Surface-mounted exit devices.
3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.26 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with door and hardware manufacturers' written instructions.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 2. Custom Steel Doors and Frames: HMMA 831.
 3. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule, but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches of door height greater than 90 inches.
- E. Lock Cylinders: Install construction cores to secure building and areas during construction period.
1. Replace construction cores with permanent cores as directed by Owner.
 2. Furnish permanent cores to Owner for installation.
- F. Key Control System:
1. Key Control Cabinet: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
 2. Key Lock Boxes: Install where indicated or approved by Architect to provide controlled access for fire and medical emergency personnel.
 3. Key Control System Software: Set up multiple-index system based on final keying schedule.
- G. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- H. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

- I. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 - 1. Do not notch perimeter gasketing to install other surface-applied hardware.
- J. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- K. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
 - 2. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 70 degrees and so that closing time complies with accessibility requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, and door hardware.

3.5 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

DOOR HARDWARE

Restoration and Expansion
Historic Metlar-Bodine House
Piscataway, Middlesex County, NJ
Architects Project No.: 1836C

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain door hardware.

3.8 DOOR HARDWARE SCHEDULE

END OF SECTION 087100

SECTION 090391 - HISTORIC TREATMENT OF PLAIN PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes historic treatment of plain painting as follows:
 - 1. Removing existing paint.
 - 2. Repairing substrates.
 - 3. Plain painting of historic surfaces.

1.3 DEFINITIONS

- A. Gloss Level 1: Matte or Flat Finish - Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 2: Velvet Finish - Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 3: Eggshell Finish - 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 4: Satin Finish - 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. Gloss Level 5: Semi-Gloss Finish - 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 6: Gloss Finish - 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. Gloss Level 7: High Gloss Finish - More than 85 units at 60 degrees, according to ASTM D 523.
- H. Historic Paint Materials: Paint materials manufactured to match historic paint formulations; either custom-formulated products or standard products of manufacturers of historic paint materials.
- I. Modern Paint Materials: Paint materials not designed to match historic paint formulations but that may be required to match historic paint colors.
- J. Plain Painting: For historic treatment, this means painting that requires attention to historic treatment requirements, but no special, decorative or artistic painting skill.
- K. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

L. Medium-Pressure Spray: 400 to 800 psi; 4 to 6 gpm.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site..
1. Review minutes of Preliminary Historic Treatment Conference that pertain to historic treatment of painting.
 2. Review methods and procedures related to historic treatment of painting including, but not limited to, the following:
 - a. Verify historic treatment specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Materials, material application, colors, patterns, and sequencing.
 - c. Fire-protection plan.
 - d. Plain painting historic treatment program.
 - e. Coordination with building occupants.

1.5 SEQUENCING AND SCHEDULING

- A. Perform historic treatment of painting in the following sequence, which includes work specified in this and other Sections:
1. Dismantle existing surface-mounted objects and hardware except items indicated to remain in place. Tag items with location identification and protect.
 2. Verify that temporary protections have been installed.
 3. Examine condition of surfaces to be painted.
 4. Remove existing paint to the degree required for each substrate and surface condition of existing paint.
 5. Apply paint system.
 6. Reinstall dismantled surface-mounted objects and hardware unless otherwise indicated.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.
- B. Samples: For each type of paint system and each pattern, color, and gloss; in sizes indicated below.
1. Include stepped Samples defining each separate coat, including fillers and primers. Resubmit until each required sheen, color, and texture is achieved.
 2. For each painted color being matched to a standardized color-coding system, include the color chips from the color-coding-system company with Samples.
 3. Include a list of materials for each coat of each Sample.
 4. Label each Sample for location and application.
 5. Sample Size:
 - a. Plain Painted Surfaces: 4-by-8-inch samples for each color and material, on hardboard.
- C. Product List: For each paint product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current MPI's "MPI Approved Products List" for each MPI-product category specified in paint systems, with the proposed product highlighted.
3. VOC content.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For historic treatment specialist(s) and paint-remover manufacturer.
- B. Plain Painting Historic Treatment Program: Submit before work begins.
- C. Color Matching Certificate: For computer color matching of historic colors.
- D. Preconstruction Test Reports: For cleaning materials, paint removers and paint coatings and systems.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra paint materials, from the same production run, that match products applied and that are packaged with protective covering for storage and identified with labels describing contents, including material, finish, source, and location on building.
 1. Quantity: Furnish Owner with an additional 3 percent, but not less than 1 gal. or one case, as appropriate, of each material and color applied.

1.9 QUALITY ASSURANCE

- A. Historic Treatment Specialist Qualifications: A qualified historic painting specialist with expertise in matching and touching up existing painting. Experience only in new painting work is insufficient experience for historic treatment work.
- B. Paint-Remover Manufacturer Qualifications: A firm regularly engaged in producing paint removers that have been used for similar historic painting applications with successful results, and with factory-authorized service representatives who are available for consultation and Project-site inspection and on-site assistance.
- C. Color Matching: Custom computer-match paint colors to colors indicated already present on the building.
- D. Plain Painting Historic Treatment Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for historic treatment work, including protection of surrounding materials and Project site and control of runoff during cleaning, paint removal, repainting, and other processes.
 1. If materials and methods other than those indicated are proposed for any phase of historic treatment work, add a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project.

- E. Mockups: Prepare mockups of historic treatment processes for each type of coating system and substrate indicated and each color and finish required to demonstrate aesthetic effects and to set quality standards for materials and execution. Duplicate appearance of approved Sample submittals.
1. Locate mockups on existing surfaces where directed by Architect and in locations that enable viewing under same conditions as the completed Work.
 2. Surface-Preparation Mockups: On existing surfaces using applicable specified methods of cleaning and other surface preparation, provide mockup sample of at least 50 sq. ft..
 3. Coating Mockups: Two wall surfaces of at least 50 sq. ft. to represent surfaces and conditions for application of each type of coating system under same conditions as the completed Work.
 - a. Plain painted surfaces.
 4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified historic treatment specialist to perform preconstruction testing of cleaning materials, paint removers and compatibility of paint coatings and systems for each indicated type of historic painted surface.
1. Use test areas as indicated and representative of proposed materials and existing construction.
 2. Propose changes to materials and methods to suit Project.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste daily.

1.12 FIELD CONDITIONS

- A. Weather Limitations: Proceed with historic treatment of painting only when existing and forecasted weather conditions are within the environmental limits set by each manufacturer's written instructions and specified requirements.
- B. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- C. Do not apply paint in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer for surface preparation and during paint application and drying periods.

PART 2 - PRODUCTS

2.1 PREPARATORY CLEANING MATERIALS

- A. Water: Potable.
- B. Hot Water: Water heated to a temperature of 140 to 160 deg F.
- C. Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium pyrophosphate (TSPP), 1/2 cup of laundry detergent that contains no ammonia, 5 quarts of 5 percent sodium hypochlorite bleach, and 15 quarts of warm water for every 5 gal. of solution required.
- D. Mildewcide: Commercial proprietary mildewcide or a job-mixed solution prepared by mixing 1/3 cup of household detergent that contains no ammonia, 1 quart of 5 percent sodium hypochlorite bleach, and 3 quarts of warm water.
- E. Abrasives for Ferrous Metal Cleaning: Aluminum oxide paper, emery paper, fine steel wool, steel scrapers, and steel-wire brushes of various sizes.
- F. Rust Remover: Manufacturer's standard phosphoric acid-based gel formulation, also called "naval jelly," for removing corrosion from iron and steel.

2.2 PAINT REMOVERS

- A. Low-Odor, Solvent-Type Paste Paint Remover: Manufacturer's standard low-odor, water-rinsable, solvent-type paste, gel, or foamed emulsion formulation for removing paint from wood, plaster, or metal as required to suit Project; and containing no methanol or methylene chloride.
 - 1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ABR Products, Inc.; ABR Citrus Paint Removers.
 - b. Cathedral Stone Products, Inc.; Masonre S-303.
 - c. Dumond Chemicals, Inc.; Peel Away 7 without paper covering; or.
 - d. Equal, when approved in advance with the Architect.

2.3 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. Colors: As selected by Architect from full range of industry colors.

2.4 MODERN PAINT MATERIALS, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

- B. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 150 g/L.
 - 3. Primers, Sealers, and Undercoaters: 200 g/L.
 - 4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 - 5. Pretreatment Wash Primers: 420 g/L.
- C. Transition Coat: Paint manufacturer's recommended coating for use where a residual existing coating is incompatible with the paint system.

2.5 MODERN PAINT MATERIALS

- A. Metal Primers:
 - 1. Primer, Alkyd, Anti-Corrosive for Metal: MPI #79. (Reference: "MPI Approved Products List," www.paintinfo.com)
 - a. Basis-of-Design Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Benjamin Moore. Super Spec HP – Alkyd Metal Primer.
 - 2) Conco Paints. Conco Pro – DTM Alkyd Rust Control Metal Primer
 - 3) M.A.B. Paints. Rust-O-Lastic Anti-Corrosive – Interior/Exterior Alkyd Metal Primer
 - 4) Equal, when approved in advance by the Architect.
- B. Wood Primers:
 - 1. Primer, Alkyd for Exterior Wood: MPI #5.
 - a. Basis-of-Design Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Benjamin Moore. Fresh Start – All Purpose Alkyd Primer or Alkyd Exterior Primer.
 - 2) Sherwin-Williams. Exterior Oil-Based Wood Primer
 - 3) PPG. Speedhide – Exterior Oil Based Wood Primer.
 - 4) Equal, when approved in advance by the Architect.
- C. Metal Paints:
 - 1. Paint, Acrylic for Metals: MPI #153.
 - a. Basis-of-Design Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Benjamin Moore. D.T.M. Acrylic Semi-Gloss.
 - 2) Sherwin-Williams. Zero VOC Acrylic Semi-Gloss
 - 3) PPG. Int/Ext Semi-Gloss Acrylic Metal Finish.
 - 4) Equal, when approved in advance by the Architect.
- D. Wood Paints:
 - 1. Paint, Acrylic for Wood (Semi-Gloss/Soft Gloss): MPI #11.
 - a. Basis-of-Design Product: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Benjamin Moore. Soft Gloss 100% Acrylic House Paint #N096
 - 2) Sherwin-Williams. Superpaint Exterior Latex Gloss, A84

- 3) PPG. Speedhide Exterior 100% Acrylic Latex Semi-Gloss
- 4) Equal, when approved in advance by the Architect.

2.6 PATCHING MATERIALS

- A. Wood-Patching Compound: Two-part, epoxy-resin, wood-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of wood repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be designed for filling voids in damaged wood materials that have deteriorated due to weathering and decay. Compound shall be capable of filling deep holes and spreading to feather edge.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Abatron, Inc.; LiquidWood with WoodEpoxy.
 - b. Advanced Repair Technology, Inc.; Primatrate with Flex-Tec HV.
 - c. ConServ Epoxy LLC; Flexible Epoxy Consolidant 100 with Flexible Epoxy Patch 200.
 - d. Gougeon Brothers, Inc.; West System (thickened with filler).
 - e. Polymeric Systems, Inc.; QuickWood.
 - f. Protective Coating Company; PC-Woody.
 - g. System Three Resins, Inc.; Sculpwood.
- B. Metal Patching Compound: Two-part, polyester-resin, metal patching compound; knife-grade formulation as recommended in writing by manufacturer for type of metal repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be produced for filling metal that has deteriorated due to corrosion. Filler shall be capable of filling deep holes and spreading to feather edge.

2.7 PROHIBITIONS

- A. The use of **sandblasting** equipment of any kind for the removal of paint is strictly prohibited.
- B. The use of **open flames** such as blow torches is strictly prohibited.
- C. The use of **heat guns** is strictly prohibited.
- D. The use of **power sanding** machines are strictly forbidden.
- E. No smoking is allowed on the job site or within ten (10) feet of the property.

PART 3 - EXECUTION

3.1 LIMITS OF TYPES OF PREPARATION WORK

- A. It is not a project requirement that all layers of paint film be removed from the existing exterior surfaces of the building to be retained. Due to the historic nature of this structure, it is required that the build-up of sound paint films be preserved on these building surfaces.

3.2 PROTECTION

- A. Comply with each manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.
 - 1. Cover adjacent surfaces with materials that are proven to resist chemical solutions being used unless the solutions will not damage adjacent surfaces. Use protective materials that are UV resistant and waterproof. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
 - 2. Do not apply chemical solutions during winds of sufficient force to spread them to unprotected surfaces.
 - 3. Neutralize and collect alkaline and acid wastes before disposal.
 - 4. Dispose of runoff from operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

3.3 HISTORIC TREATMENT OF PAINTING, GENERAL

- A. Historic Treatment Appearance Standard: Completed work is to have a uniform appearance as viewed by Architect from building exterior at 20 feet away from painted surface.
- B. Execution of the Work: In treating historic items, disturb them as minimally as possible and as follows:
 - 1. Remove failed coatings and corrosion and repaint.
 - 2. Verify that substrate surface conditions are suitable for painting.
 - 3. Allow other trades to repair items in place and retain as much original material as possible before repainting.
 - 4. Reproduce original, historic paint systems where indicated or scheduled.
 - 5. Install temporary protective measures to protect historic painted surfaces that shall be treated later.
- C. Mechanical Abrasion: Where mechanical abrasion is needed for the work, use only the gentlest mechanical methods, such as scraping and lightly hand sanding, that will not abrade softer substrates, reducing clarity of detail. Do not use abrasive methods such as rotary sanding, rotary wire brushing, or power tools except as indicated as part of the historic treatment program and as approved by Architect.
- D. Heat Processes: Do not use torches, heat guns, or heat plates.

3.4 EXAMINATION

- A. Examine substrates and conditions, with historic treatment specialist present, for compliance with requirements for maximum moisture content and other conditions affecting performance of painting work. Comply with paint manufacturer's written instructions for inspection.
- B. Maximum Moisture Content of Substrates: Do not begin application of coatings unless moisture content of exposed surface is below the maximum value recommended in writing by paint manufacturer and not greater than the following maximum values when measured with an electronic moisture meter appropriate to the substrate material:

1. Wood: 15 percent.
- C. Alkalinity: Do not begin application of coatings unless surface alkalinity is within range recommended in writing by paint manufacturer. Conduct alkali testing with litmus paper on exposed plaster, cementitious, and masonry surfaces.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
 1. If existing surfaces cannot be prepared to an acceptable condition for proper finishing by using specified surface-preparation methods, notify Architect in writing.
- E. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.5 PREPARATORY CLEANING

- A. General: Use only the gentlest, appropriate method necessary to clean surfaces in preparation for painting. Clean all surfaces, corners, contours, and interstices.
- B. Detergent Cleaning: Wash surfaces by hand using clean rags, sponges, and bristle brushes. Scrub surface with detergent solution and bristle brush until soil is thoroughly dislodged and can be removed by rinsing. Use small brushes to remove soil from joints and crevices. Dip brush in solution often to ensure that adequate fresh detergent is used and that surface remains wet. Rinse with water applied by clean rags or sponges.
- C. Solvent Cleaning: Use solvent cleaning to remove oil, grease, smoke, tar, and asphalt from painted or unpainted surfaces before other preparation work. Wipe surfaces with solvent using clean rags and sponges. If necessary, spot-solvent cleaning may be employed just prior to commencement of paint application, provided enough time is allowed for complete evaporation. Use clean solvent and clean rags for the final wash to ensure that all foreign materials have been removed. Do not use solvents, including primer thinner and turpentine, that leave residue.
- D. Mildew: Clean off existing mildew, algae, moss, plant material, loose paint, grease, dirt, and other debris by scrubbing with bristle brush or sponge and detergent solution. Scrub mildewed areas with mildewcide. Rinse with water applied by clean rags or sponges.
- E. Chemical Rust Removal:
 1. Remove loose rust scale with approved abrasives for ferrous-metal cleaning.
 2. Apply rust remover with brushes or as recommended in writing by manufacturer.
 3. Allow rust remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing. Do not allow extended dwell time.
 4. Wipe off residue with mineral spirits and either steel wool or soft rags, or clean with method recommended in writing by manufacturer to remove residue.
 5. Dry immediately with clean, soft cloths. Follow direction of grain in metal.
 6. Prime immediately to prevent rust. Do not touch cleaned metal surface until primed.
- F. Mechanical Rust Removal:

1. Remove rust with approved abrasives for ferrous-metal cleaning. Clean to bright metal.
2. Wipe off residue with mineral spirits and either steel wool or soft rags.
3. Dry immediately with clean, soft cloths. Follow direction of grain in metal.
4. Prime immediately to prevent rust. Do not touch cleaned metal surface until primed.

3.6 PAINT REMOVAL

- A. General: Remove paint where indicated. Where cleaning methods have been attempted and further removal of the paint is required because of incompatible or unsatisfactory surfaces for repainting, remove paint to extent required by conditions.
1. Application: Apply paint removers according to paint-remover manufacturer's written instructions. Do not allow paint removers to remain on surface for periods longer than those indicated or recommended in writing by manufacturer.
 - a. Apply materials to all surfaces, corners, contours, and interstices, to provide a uniform final appearance without streaks.
 - b. After work is complete, remove protection no longer required. Remove tape and adhesive marks.
 2. Brushes: Use brushes that are resistant to chemicals being used.
 - a. Metal Substrates: If using wire brushes on metal, use brushes of same metal composition as metal being treated.
 - b. Wood Substrates: Do not use wire brushes.
 3. Spray Equipment: Use spray equipment that provides controlled application at volume and pressure indicated, measured at nozzle. Adjust pressure and volume to ensure that spray methods do not damage surfaces.
 - a. Equip units with pressure gages.
 - b. Unless otherwise indicated, hold spray nozzle at least 6 inches from surface and apply material in horizontal, back-and-forth sweeping motion, overlapping previous strokes to produce uniform coverage.
 - c. For chemical spray application, use low-pressure tank or chemical pump suitable for chemical indicated, equipped with nozzle having a cone-shaped spray.
 - d. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
 - e. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.
- B. Paint Removal with Hand Tools:
1. Remove paint manually using hand-held scrapers, natural bristle brushes, metal brushes, sandpaper, and metallic wool as appropriate for the substrate material. Do not use other methods except as indicated as part of the historic treatment program and as approved by Architect.
 2. Rough surfaces are to be sanded thoroughly to feather edges smooth with adjacent surfaces.
 3. Do not remove all imperfections in the wood materials.
 4. Due to the historical nature of the work, it is not desirable to completely strip those surfaces to be painted of all paint films.
 5. Where historic paint film layers are to be retained, provide feathered hand sanding of all surfaces for proper bonding of new paint materials.

- C. Paint Removal with Solvent-Type Paste Paint Remover:
1. Remove loose and peeling paint using water, scrapers, stiff brushes, or a combination of these. Let surface dry thoroughly.
 2. Apply thick coating of paint remover to dry, painted surface with natural-fiber cleaning brush, deep-nap roller, or large paintbrush. Apply in one or two coats according to manufacturer's written instructions.
 3. Allow paint remover to remain on surface for period recommended in writing by manufacturer or as determined by preconstruction testing.
 4. Rinse with cold water applied by low-pressure spray to remove chemicals and paint residue.
 5. Use mechanical methods recommended in writing by manufacturer to remove chemicals and paint residue.
 6. Repeat process if necessary to remove all paint.

3.7 SUBSTRATE REPAIR

- A. General: Repair substrate surface defects that are inconsistent with the surface appearance of adjacent materials and finishes.
- B. Wood Substrate:
1. Repair wood defects including dents and gouges more than 1/8 inch in size and all holes and cracks by filling with wood-patching compound and sanding smooth. Reset or remove protruding fasteners.
 2. Where existing paint is allowed to remain, sand irregular buildup of paint, runs, and sags to achieve a uniformly smooth surface.
- C. Metal Substrate:
1. Preparation: Treat repair locations by wire-brushing and solvent cleaning. Use chemical or mechanical rust removal method to clean off rust.
 2. Defects in Metal Surfaces: Repair non-load-bearing defects in existing metal surfaces, including dents and gouges more than 1/8 inch deep or 1/2 inch across and all holes and cracks by filling with metal patching compound and sanding smooth. Remove burrs and protruding fasteners.
 3. Priming: Prime iron and steel surfaces immediately after repair to prevent flash rusting. Stripe paint corners, crevices, bolts, welds, and sharp edges. Apply two coats to surfaces that are inaccessible after completion of the Work.

3.8 PAINT APPLICATION, GENERAL

- A. Comply with manufacturers' written instructions for application methods unless otherwise indicated in this Section.
- B. Prepare surfaces to be painted according to the Surface-Preparation Schedule and with manufacturer's written instructions for each substrate condition.
- C. Apply a transition coat over incompatible existing coatings.

- D. Metal Substrate: Stripe paint corners, crevices, bolts, welds, and sharp edges before applying full coat. Apply two coats to surfaces that are inaccessible after completion of the Work. Tint stripe coat different than the main coating and apply with brush.
- E. Blending Plain Painted Surfaces: When painting new substrates patched into existing surfaces or touching up missing or damaged finishes, apply coating system specified for the specific substrate. Apply final finish coat over entire surface from edge to edge and corner to corner.

3.9 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage paint-remover manufacturer's factory-authorized service representative for consultation and Project-site inspection, and provide on-site assistance when requested by Architect.

3.10 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.11 SURFACE-PREPARATION SCHEDULE

- A. General: Before painting, prepare surfaces where indicated on Drawings for painting according to applicable requirements specified in this schedule.
 - 1. Examine surfaces to evaluate each surface condition according to paragraphs below.
 - 2. Where existing degree of soiling prevents examination, preclean surface and allow it to dry before making an evaluation.
 - 3. Repair substrate defects according to "Substrate Repair" Article.
 - 4. Due to the lack of paint on existing exterior wooden elements for a long duration, the wood may require rehydrating and consolidating the wood as part of the surface preparation techniques. Wood hydration can be achieved with a Dutch or Linseed oil. Consolidation shall be used with a two-part epoxy consolidant. Warn against use of consolidant in too great an amount as it will fail over time. Consult architect prior to undertaking hydration/consolidation of wooden elements.
- B. Surface Preparation for MPI DSD - Sound Surface (Degree of Surface Degradation):
 - 1. Surface Condition: Existing paint film in good condition and tightly adhered.
 - 2. Paint Removal: Not required.

3. Preparation for Painting: Wash surface by detergent cleaning; use solvent cleaning where needed. Roughen or degloss cleaned surfaces to ensure paint adhesion according to paint manufacturer's written instructions.
- C. Surface Preparation for MPI DSD 1 - Slight Deteriorated Surface (Degree of Surface Degradation):
1. Surface Condition: Paint film cracked or broken but adhered. May show fading, gloss reduction, slight surface contamination, minor pin holes scratches and other minor cosmetic defects.
 2. Paint Removal: Scrape by hand-tool cleaning methods to remove loose paint until only tightly adhered paint remains.
 3. Preparation for Painting: Wash surface by detergent cleaning; use other cleaning methods for small areas of bare substrate if required. Roughen, degloss, and sand the cleaned surfaces to ensure paint adhesion and a smooth finish according to paint manufacturer's written instructions.
- D. Surface Preparation for MPI DSD 2 - Moderately Deteriorated Surface (Degree of Surface Degradation):
1. Surface Condition: Paint film loose, flaking, or peeling. Indicates small areas of peeling, flaking, slight cracking and staining.
 2. Paint Removal: Remove loose, flaking, or peeling paint film by hand-tool or chemical paint-removal methods.
 3. Preparation for Painting: Wash surface by detergent cleaning; use solvent cleaning where needed. Use other cleaning methods for small areas of bare substrate if required. Sand surfaces to smooth remaining paint film edges. Prepare bare cleaned surface to be painted according to paint manufacturer's written instructions for substrate construction materials.
- E. Surface Preparation for MPI DSD 3 - Severely Deteriorated Surface (Degree of Surface Degradation):
1. Surface Condition: Paint film severely deteriorated and obscuring fine architectural detail work because of paint-layer buildup and may require surface indicated to have paint completely removed to either a sound paint layer or the substrate, whichever is the least intrusive.
 2. Paint Removal: Remove paint film by hand-tool and chemical paint-removal methods. Remove rust.
 3. Preparation for Painting: Prepare bare/cleaned surface according to paint manufacturer's written instructions for substrate construction materials.
- F. Surface Preparation for MPI DSD 4 - Substrate Damage (Degree of Surface Degradation):
1. Surface Condition: Missing material, small holes and openings, and deteriorated or corroded substrate.
 2. Substrate Preparation: Repair, replace, and treat substrate according to "Substrate Repair" Article and requirements in other Specification Sections.
 3. Preparation for Painting: Sand substrate surfaces to smooth remaining paint film edges and prepare according to paint manufacturer's written instructions for substrate construction materials. Remove rust.
 4. Painting: Paint as required for MPI DSD 2 - Moderately Deteriorated Surface degree of surface degradation.

3.12 PAINT APPLICATION

- A. Do not paint unless substrates are acceptable and until all environmental conditions are acceptable for applications of products.

- B. Apply paint or stain in accordance with MPI Painting Manual for the appropriate grade finish requirements.
- C. Apply paint in a workmanlike manner using skilled and trade qualified applicators as noted under Quality Assurance.
- D. Apply paint and coating with an appropriate time frame after cleaning when environmental conditions encourage flash-rusting, rusting, contamination or the manufacturer's paint specifications require earlier applications.
- E. Painting coats specified are intended to cover surface satisfactorily when applied at proper consistency and in accordance with manufacturer's recommendations.
- F. Tint each coat of paint progressively lighter to enable confirmation of number of coats.
- G. Unless other approved, apply a minimum of four coats of paint where deep or bright colors are used to achieve satisfactory results.
- H. Sand and dust between each coat to provide an anchor for next coat and to remove defects visible from a distance of up to 39 inches.
- I. Do not apply finishes on surfaces that are not sufficiently dry. Unless manufacturer's directions state otherwise, each coat shall be sufficiently dry and hard before a following coat is applied.
- J. Paint finish shall continue through behind all wall-mounted items.

3.13 EXTERIOR HISTORIC PAINTING SCHEDULE

- A. Ferrous Metal Substrates: :
 - 1. Alkyd System: MPI EXT 5.1D with a matte or flat finish or to match existing. Provide sample for Architect review.
 - a. Prime Coat: For MPI DSD 1 degree of surface degradation, touch up with topcoat.
 - b. Prime Coat: For MPI DSD 2 degree of surface degradation, spot prime with Primer, Metal, Surface Tolerant, MPI #23.
 - c. Prime Coat: For MPI DSD 3 degree of surface degradation, fully prime coat with Primer, Metal, Surface Tolerant, MPI #23.
 - d. Intermediate Coat: Alkyd, exterior, matching topcoat.
 - e. Topcoat: Alkyd, exterior, flat/matte (Gloss Level 1), MPI #8.
 - f. Color: Flat black.
- B. Wood Windows, Frames, and Moldings (Cornices, Fascias, and Entablatures, etc.) New and Existing:
 - 1. Latex System: MPI EXT 6.3A system over a transition coat.
 - a. Prime Coat: For MPI DSD 1 degree of surface degradation, touch up with topcoat.
 - b. Prime Coat: For MPI DSD 2 degree of surface degradation, spot prime with Primer, Alkyd for Exterior Wood, MPI #5.
 - c. Prime Coat: For MPI DSD 3 degree of surface degradation, fully prime coat with Primer, Alkyd for Exterior Wood, MPI #5.

- d. Intermediate Coat: Latex, exterior, matching topcoat.
 - e. Topcoat: Latex, exterior semigloss (Gloss Level 5), MPI #11.
 - f. Color: Light grayish yellow of Munsell # 2.5Y 8/2, provide sample.
- C. Wood Siding (New and Existing):
- 1. Latex System: MPI EXT 6.6A system over a transition coat.
 - a. Prime Coat: For MPI DSD 1 degree of surface degradation, touch up with topcoat.
 - b. Prime Coat: For MPI DSD 2 degree of surface degradation, spot prime with Primer, Alkyd for Exterior Wood, MPI #5.
 - c. Prime Coat: For MPI DSD 3 degree of surface degradation, fully prime coat with Primer, Alkyd for Exterior Wood, MPI #5.
 - d. Intermediate Coat: Latex, exterior, matching topcoat.
 - e. Topcoat: Latex, exterior, low sheen (Gloss Levels 3-4), MPI #15.
 - f. Color: Light grayish yellow of Munsell # 2.5Y 8/2, provide sample.

END OF SECTION 090391

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.
- C. Samples for Initial Selection: For each type of trim accessory indicated.
- D. Samples for Verification: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Build mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 - 3. Simulate finished lighting conditions for review of mockups.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Wallboard: ASTM C1396/C1396M.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Georgia-Pacific Gypsum LLC.
 - b. National Gypsum Company.
 - c. USG Corporation.
 - 2. Thickness: 1/2 inch.
 - 3. Long Edges: Tapered.
- B. Gypsum Board, Type X: ASTM C1396/C1396M.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Georgia-Pacific Gypsum LLC.
 - b. National Gypsum Company.
 - c. USG Corporation.

2. Thickness: 5/8 inch.
 3. Long Edges: Tapered.
- C. Gypsum Ceiling Board: ASTM C1396/C1396M.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Georgia-Pacific Gypsum LLC.](#)
 - b. [National Gypsum Company.](#)
 - c. [USG Corporation.](#)
 2. Thickness: 1/2 inch.
 3. Long Edges: Tapered.
- D. Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [Georgia-Pacific Gypsum LLC.](#)
 - b. [National Gypsum Company.](#)
 - c. [USG Corporation.](#)
 2. Core: 5/8 inch, Type X.
 3. Long Edges: Tapered.
 4. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:
1. Interior Gypsum Board: Paper.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
 1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
- E. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.
- F. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."
- G. Vapor Retarder: As specified in Section 072600 "Vapor Retarders."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

- K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Wallboard Type: Vertical surfaces unless otherwise indicated.
 - 2. Type X: As indicated on Drawings.
 - 3. Ceiling Type: Ceiling surfaces.
 - 4. Mold-Resistant Type: In the kitchen space.
 - 5. Type C: Where required for specific fire-resistance-rated assembly indicated.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints [at locations indicated on Drawings] [according to ASTM C840 and in specific locations approved by Architect for visual effect].
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners unless otherwise indicated.
 - 2. Bullnose Bead: Use at outside corners.
 - 3. LC-Bead: Use at exposed panel edges.
 - 4. L-Bead: Use where indicated.
 - 5. U-Bead: Use at exposed panel edges.

3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.6 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on exterior substrates.
 - 1. Concrete.
 - 2. Concrete masonry units (CMUs).
 - 3. Galvanized metal.
 - 4. Aluminum (not anodized or otherwise coated).
 - 5. Wood.
 - 6. Fiberglass.
 - 7. Plastic.
 - 8. Gypsum board.

1.3 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.
- B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.
- D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.
- E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.
- F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.

- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials[, **from the same product run,**] that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: [5] <Insert number> percent, but not less than [1 gal.] <Insert value> of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

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- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Benjamin Moore & Co.
 - 2. PPG Paints.
 - 3. Sherwin-Williams Company (The).
 - 4. Zinsser; Rust-Oleum Corporation.
- B. Products: Subject to compliance with requirements, [provide product] [provide one of the products] [available products that may be incorporated into the Work include, but are not limited to products] listed in the Exterior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: As selected by Architect from manufacturer's full range.
 - 1. Eighty percent of surface area will be painted with deep tones.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Fiber-Cement Board: 12 percent.
 - 3. Masonry (Clay and CMUs): 12 percent.
 - 4. Wood: 15 percent.
 - 5. Portland Cement Plaster: 12 percent.

- 6. Gypsum Board: 12 percent.
- C. Portland Cement Plaster Substrates: Verify that plaster is fully cured.
- D. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- F. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:

1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
4. Paint entire exposed surface of window frames and sashes.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view:
 - a. Equipment, including panelboards and switch gear.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Tanks that do not have factory-applied final finishes.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

- A. Steel and Iron Substrates:
 - 1. Alkyd System MPI EXT 5.1D:
 - a. Prime Coat: Primer, alkyd, anticorrosive, for metal, MPI #79.
 - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
 - c. Topcoat: Alkyd, exterior, flat (MPI Gloss Level 1), MPI #8.
- B. Wood Substrates: Wood trim Architectural woodwork Doors Windows Wood board siding and wood fences.
 - 1. Latex System MPI EXT 6.3A:
 - a. Prime Coat: Primer, alkyd for exterior wood, MPI #5.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, semi-gloss (MPI Gloss Level 5), MPI #11.
- C. Wood Substrates: Wood-based panel products.
 - 1. Latex over Alkyd Primer System MPI EXT 6.4G:
 - a. Prime Coat: Primer, alkyd for exterior wood, MPI #5.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4), MPI #15.
- D. Wood Substrates: Wood shingles and shakes (excluding roofs).

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1. Latex over Alkyd Primer System MPI EXT 6.6A:
 - a. Prime Coat: Primer, alkyd for exterior wood, MPI #5.
 - b. Intermediate Coat: Latex, exterior, matching topcoat.
 - c. Topcoat: Latex, exterior, low sheen (MPI Gloss Level 3-4), MPI #15.

- E. Fiberglass Substrates:
 1. Alkyd System MPI EXT 6.7B:
 - a. Prime Coat: Primer, bonding, solvent based, MPI #69.
 - b. Intermediate Coat: Exterior, alkyd enamel, matching topcoat.
 - c. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on interior substrates.
 - 1. Concrete masonry units (CMUs).
 - 2. Galvanized metal.
 - 3. Aluminum (not anodized or otherwise coated).
 - 4. Wood.
 - 5. Plastic.
 - 6. Gypsum board.
- B. Related Requirements:
 - 1. Section 055000 "Metal Fabrications" for shop priming metal fabrications.

1.3 DEFINITIONS

- A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D523.
- B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D523.
- D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D523.
- E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D523.
- F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D523.
- G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 2. Indicate VOC content.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
1. Submit Samples on rigid backing, 8 inches square.
 2. Apply coats on Samples in steps to show each coat required for system.
 3. Label each coat of each Sample.
 4. Label each Sample for location and application area.
- D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
 - b. Other Items: Architect will designate items or areas required.
 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. [Benjamin Moore & Co.](#)
 - 2. [M.A.B. Paints.](#)
 - 3. [PPG Architectural Finishes, Inc.](#)
 - 4. [Pratt & Lambert.](#)
 - 5. [Sherwin-Williams Company \(The\).](#)
- B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in the Interior Painting Schedule for the paint category indicated.

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. Colors: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Fiber-Cement Board: 12 percent.
 - 3. Masonry (Clay and CMUs): 12 percent.
 - 4. Wood: 15 percent.
 - 5. Gypsum Board: 12 percent.
 - 6. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- F. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.

- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Do not Paint the following work where exposed in equipment rooms:
 - a. Equipment, including panelboards[**and switch gear**].

- b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Tanks that do not have factory-applied final finishes.
 - h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
2. Paint the following work where exposed in occupied spaces:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - h. Other items as directed by Architect.
 3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

1. Alkyd Floor Enamel System MPI INT 3.2B:
 - a. Prime Coat: Floor enamel, alkyd, matching topcoat.
 - b. Intermediate Coat: Floor enamel, alkyd, matching topcoat.
 - c. Topcoat: Floor enamel, alkyd, gloss (MPI Gloss Level 6), MPI #27.

- B. Steel Substrates:
 1. Latex System, Alkyd Primer MPI INT 5.1Q:
 - a. Prime Coat: Primer, alkyd, anti-corrosive, for metal, MPI #79.
 - b. Prime Coat: Shop primer specified in Section where substrate is specified.
 - c. Intermediate Coat: Latex, interior, matching topcoat.
 - d. Topcoat: Latex, interior (MPI Gloss Level 2), MPI #44.

- C. Wood Substrates: Wood trim, Architectural woodwork, Doors, Windows and casework.
 1. Latex over Alkyd Primer System MPI INT 6.3U:
 - a. Prime Coat: Primer sealer, alkyd, interior, MPI #45.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, semi-gloss (MPI Gloss Level 5), MPI #54.

- D. Fiberglass Substrates:
 1. Latex System MPI INT 6.7AA:
 - a. Prime Coat: Primer, bonding, solvent based, MPI #69.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, semi-gloss (MPI Gloss Level 5), MPI #54.

- E. Gypsum Board Substrates:
 1. Latex over Latex Sealer System MPI INT 9.2A:
 - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior (MPI Gloss Level 3), MPI #52.

END OF SECTION 099123

SECTION 101419 – DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Rooms Signs.

1.3 COORDINATION

- A. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For dimensional letter signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.
- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Characters: Full-size sample of each type, style and color specified including method of attachment.
 - 2. Exposed Accessories: Full-size Sample of each accessory type.
- E. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer of products.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ROOM SIGNS

- A. Room Signs: Provide room signage with raised characters and Melamine Plastic. Signs shall have rugged, two-color, scratch resistant, non-static, fire retardant, washable melamine surface laminate with a non-glare surface and a tough brown phenolic core which is painted a contrasting color after artwork has been engraved into the surface.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Best Sign Systems, Inc..
 - b. ASI Sign Systems, Inc.
 - c. Gemini Incorporated.
 - d. Equal, when approved in advance by the Architect..
- B. Signs shall have the following characteristics:
 - 1. Tactile characters/symbols shall be raised 1/32 inch from sign plate face for ADA compliance.
 - 2. Signs shall be of one-piece construction; added-on and/or engraved characters are unacceptable.
 - 3. Text on signs needing to comply with ADA shall be accompanied by Grade 2 braille.
 - 4. All letters, numbers and/or symbols shall contrast with their background – either light characters on a dark background or dark characters on a light background. Characters and background shall have matte finish.
- C. Sign material shall consist of Melamine Plastic, approximately 1/8" thick, with background painted a contrasting color.
- D. Lettering style shall be Helvetica or similar, upper and lower.

- E. Sizes of letters and numbers shall be as follows:
 - 1. Room numbers shall be 5/8" high.
 - 2. Lettering for room usage and directional identification shall be 5/8" high.
 - 3. Lettering for restroom identification shall be 5/8" high, corresponding symbols shall be 3" high.
- F. Letters and numbers shall be centered on sign.
- G. Grade 2 braille for signs requiring braille shall be placed directly below last line of letters or numbers.
- H. Corner style shall be chosen from the list of standard options provided by the manufacturer and presented to the Architect for review.

2.2 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - b. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant Allen-head slots unless otherwise indicated.
 - 3. Sign Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.

2.3 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 - 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 - 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 - 3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 - 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 - 5. Internally brace signs for stability and for securing fasteners.
 - 6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

2.4 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 - 3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Methods:
 - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - 2. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.

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- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 101419

SECTION 101420 – EXTERIOR SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Barrier-free Parking and Directional Signs.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For dimensional letter signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each sign at least half size.
- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Characters: Full-size sample of each type, style and color specified including method of attachment.
 - 2. Exposed Accessories: Full-size Sample of each accessory type.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer of products.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Separation or delamination of sheet materials and components.
2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXTERIOR SIGNS

- A. Design is based on standard products manufactured by :
 1. General Visual Systems, Cape Girardeau, MO.
 2. Allenite Signs, Kansas City, MO; or
 3. Equal, when approved in advance by the Architect.
- B. Parking Spaces
 1. Each accessible parking space shall be marked with an R7-8 sign from the Manual of Uniform Traffic Control Devices, displaying the international symbol of accessibility.
 2. Beneath the R7-8 sign, each parking space shall also be marked with an R7-8 sign as required by N.J.S.A. 39:4 - 197.3c, containing the following language:



PENALTY \$250 FIRST OFFENSE
SUBSEQUENT OFFENSES
\$250 MINIMUM AND/OR
UP TO 90 DAYS COMMUNITY SERVICE
TOW AWAY ZONE

3. The bottom edge of the R7-8 sign shall be mounted 60" above the parking lot or sidewalk surface when the sign is parallel to the sidewalk and approximately 72 inches above the parking lot or sidewalk surface when the sign is perpendicular to the sidewalk.
 4. The R7-8 sign shall be centered and mounted at the head of each parking space.
- C. Directional Signage
 1. Each accessible route shall be marked with an accessible route sign displays the international symbol of accessibility and a directional arrow. Additional wording as requested by the Owner is permissible as long as the accessible markings and directions are clear.
 2. The bottom of the sign shall be mounted 3' – 4" above level grade and set parallel to the sidewalk.
 3. The sign shall be mounted near the accessible parking in a manner that it clear the accessible walk. Field verify location with Architect prior to installation.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Install the work of this section in strict accordance with the manufacturers' recommendations as approved by the Architect using only approved mounting materials and locating all components firmly into position, level and plumb.

END OF SECTION 101419

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
 - 1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each mounting bracket indicated.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - b. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
 - c. Larsens Manufacturing Company.
 - d. Potter Roemer LLC.
 - e. Or Approved Equal.
 3. Valves: Manufacturer's standard.
 4. Handles and Levers: Manufacturer's standard.
 5. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 4-A:60-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Amerex Corporation.
 - b. Ansul Incorporated.
 - c. Badger Fire Protection.
 - d. Buckeye Fire Equipment Company.
 - e. Fire End & Croker Corporation.
 - f. Guardian Fire Equipment, Inc.
 - g. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - h. Larsens Manufacturing Company.
 - i. Nystrom Building Products.
 - j. Potter Roemer LLC.
 - k. Strike First Corporation of America.
 - l. Or Approved Equal.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

FIRE EXTINGUISHERS

Restoration and Expansion
Historic Metlar-Bodine House
Piscataway, Middlesex County, NJ
Architects Project No.: 1836C

- a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
 - 1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

SECTION 114000 - FOODSERVICE EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fabricated equipment.
 - 2. Cooking equipment.
 - 3. Self-contained refrigeration equipment.
 - 4. Warewashing equipment.
 - 5. Serving equipment.
 - 6. Utility distribution systems.

1.3 COORDINATION

- A. Coordinate foodservice equipment layout and installation with other work, including layout and installation of lighting fixtures, HVAC equipment, and fire-suppression system components.
- B. Coordinate locations and requirements of utility service connections.
- C. Coordinate sizes, locations, and requirements of the following:
 - 1. Overhead equipment supports.
 - 2. Equipment bases.
 - 3. Floor areas with positive slopes to drains.
 - 4. Floor sinks and drains serving foodservice equipment.
 - 5. Roof curbs, equipment supports, and penetrations.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include the following:
 - 1. Manufacturer's model number.
 - 2. Accessories and components that will be included for Project.
 - 3. Clearance requirements for access and maintenance.
 - 4. Utility service connections for water, drainage, power, and fuel; include roughing-in dimensions.
- B. Shop Drawings: For fabricated equipment. Include plans, elevations, sections, roughing-in dimensions, fabrication details, utility service requirements, and attachments to other work.
- C. Samples for Initial Selection: For units with factory-applied color finishes.

- D. Samples for Verification: For each factory-applied color finish required, in manufacturer's standard sizes.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: For foodservice facilities.
 - 1. Indicate locations of foodservice equipment and connections to utilities.
 - 2. Key equipment using same designations as indicated on Drawings.
 - 3. Include plans and elevations; clearance requirements for equipment access and maintenance; details of equipment supports; and utility service characteristics.
 - 4. Include details of seismic bracing for equipment.
- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For foodservice equipment to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Product Schedule: For each foodservice equipment item, include the following:
 - 1) Designation indicated on Drawings.
 - 2) Manufacturer's name and model number.
 - 3) List of factory-authorized service agencies including addresses and telephone numbers.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of construction contiguous with foodservice equipment by field measurements before fabrication. Indicate measurements on Coordination Drawings.

1.8 WARRANTY

- A. Refrigeration Compressor Warranty: Manufacturer agrees to repair or replace compressors that fail in materials or workmanship within specified warranty period.
 - 1. Failure includes, but is not limited to, inability to maintain set temperature.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NSF Standards: Provide equipment that bears NSF Certification Mark or UL Classification Mark certifying compliance with applicable NSF standards.

- B. UL Certification: Provide electric and fuel-burning equipment and components that are evaluated by UL for fire, electric shock, and casualty hazards according to applicable safety standards, and that are UL certified for compliance and labeled for intended use.
- C. Regulatory Requirements: Install equipment to comply with the following:
 - 1. ASHRAE 15, "Safety Code for Mechanical Refrigeration."
 - 2. NFPA 54, "National Fuel Gas Code."
 - 3. NFPA 70, "National Electrical Code."
 - 4. NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations."
- D. Seismic Restraints: Comply with SMACNA's "Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines," Appendix A, "Seismic Restraint Details," unless otherwise indicated.

2.2 FABRICATED EQUIPMENT

- A. Stainless Steel Sinks:
 - 1. Acceptable Manufacturers:
 - a. Regency;
 - b. Advance;
 - c. Steelton; or
 - d. Approved Equal.
 - 2. Description: Three-compartment sink(s). Fabricate units of welded stainless steel, sound deadened.
 - a. Bowls: Stainless steel, Type 304, 0.062 inch thick.
 - b. Integral Drainboards: Stainless steel, Type 304, 0.062 inch thick.
 - c. Body: Stainless steel, Type 304, 0.062 inch thick.
 - 1) Back Splash: Manufacturer's standard height.
 - 2) Side Splash: Manufacturer's standard height.
 - d. Legs and Feet: Stainless steel tubing legs with adjustable bullet feet.
 - e. Accessories:
 - 1) Faucets and Spouts: 8 x 1.15 gpm wall-mounted pre-rinse faucet with 8" centers/ceramic cartridge/brass fittings/44 inch hose length.
 - 2) Vacuum breaker.
 - 3) Lever waste with overflow.
 - 4) Basket strainer.
 - 5) Continuous waste.
 - 6) Scrap trough.
 - 7) Control bracket for food waste disposer controls.
 - 8) Scrap block and hole.
 - 9) Stainless steel pot rack.
 - 3. Stainless Steel Sheet: ASTM A240/A240M, austenitic stainless steel, type as indicated.
 - 4. Fabrication: Prepare sink for installation of the following equipment items:
 - a. Water heater.
 - b. Food waste disposer; weld disposer cone or collar into sink.
 - 5. Stainless Steel Finish: Directional satin finish, ASTM A480/A480M, No. 4.

B. Stainless Steel Tables:

1. Acceptable Manufacturers:
 - a. Regency;
 - b. Advance;
 - c. Steelton; or
 - d. Approved Equal.
2. Description: Flat-countertop Prep/Dish tables.
 - a. Tops: Stainless steel, Type 304, 0.062 inch thick, reinforced and sound deadened.
 - 1) Back Splash: Manufacturer's standard height.
 - 2) Edge: Bullnose on front edge, straight on sides and back.
 - b. Welded Undershef: Stainless steel, Type 304, 0.050 inch thick.
 - c. Crossbracing: Stainless steel tubing, welded to legs.
 - d. Sink: Stainless steel, Type 304, 0.078 inch thick, welded into tabletop and including the following:
 - 1) Faucet and Spout: Heavy-duty bar faucet with 8" swing spout and 4" centers; brass fittings.
 - 2) Vacuum breaker.
 - 3) Leverwaste with overflow.
 - 4) Basket strainer.
 - 5) Tail piece.
 - e. Legs: Stainless steel tubing.
 - f. Feet: Stainless steel adjustable bullets.
3. Materials:
 - a. Stainless Steel Sheet: ASTM A240/A240M, austenitic stainless steel, type as indicated.
4. Stainless Steel Finish: Directional satin finish, ASTM A480/A480M, No. 4.

C. Stainless Steel Hand Sinks:

1. Acceptable Manufacturers:
 - a. Regency;
 - b. Advance;
 - c. Steelton; or
 - d. Approved Equal.
2. Description: Lavatory sink. Fabricate units of stainless steel, Type 304, 0.050 inch thick.
 - a. Operation: Wrist handle.
 - b. Faucet and Spout: Integral with the hand-washing sink.
 - c. Accessories:
 - 1) Chrome-plated tail piece and P trap, NPS 1-1/2, with 0.045-inch minimum wall thickness.
 - 2) Strainer basket with metal post.
 - 3) Liquid soap dispenser, splash mounted.
 - 4) Liquid soap and towel dispenser.
 - 5) Towel dispenser.
 - 6) Tubular wall supports.
 - 7) Skirt assembly for support.
 - 8) Side splashes.
3. Stainless Steel Sheet: ASTM A240/A240M, austenitic stainless steel, type as indicated.

- 4. Stainless Steel Finish: Directional satin finish, ASTM A480/A480M, No. 4.

2.3 COOKING EQUIPMENT

A. Range with Oven:

- 1. Basis of Design: Cooking Performance Group or Approved Equal.
- 2. Description:
 - a. (4) 30,000 BTU open top burners with cast iron lift-off grates for easy cleaning
 - b. Stainless steel front and aluminum sides; porcelainized oven bottom
 - c. 4 3/4" deep back shelf and 2" front ledge for added storage and safety
 - d. 6" adjustable stainless-steel legs
 - e. Electrical Service: Equip unit for connection to service indicated on Drawings.
 - f. Gas Service: Natural gas.

B. Ventless Canopy Hood:

- 1. Basis of Design: Halifax or Approved Equal
- 2. Description: 4' wide Commercial Kitchen Hood System with Fire Suppression.

| | |
|----------------------|---------------------------|
| Length | 4 Feet |
| Depth | 48 Inches |
| Height | 24 Inches |
| Voltage | 115 Volts |
| Fire Suppression | Required |
| Gauge | 18 Inches |
| Stainless Steel Type | Type 430 |
| Style | Exhaust Only Hood Systems |
| Type | Type 1 |

- a. Electrical Service: Equip unit for connection to service indicated on Drawings.

C. Microwave Ovens <Insert drawing designation>:

- 1. Basis of Design: Sharp or Approved Equal.
- 2. Description: 1100-W cooking power.
 - a. Electrical Service: Equip unit with plug and cord for 120-V service.

D. Automatic Airpot Coffee Brewer:

- 1. Basis of Design: Bunn or Approved Equal.
- 2. Description: Single.
 - a. Brews between 3.8 and 7.5 gallons per hour
 - b. Stainless steel construction

- c. Separate hot water faucet for soups & other hot drinks
 - d. Digital timer
 - e. Pourover feature included as a backup alternative
 - f. 120V
3. Electrical Service: Equip unit for connection to service indicated on Drawings.

2.4 REFRIGERATION EQUIPMENT

- A. Refrigeration Equipment : Refrigerators/Freezers.
1. Basis of Design: General Electric Side-by-Side Refrigerator or Approved Equal.
 2. Description: Reach-in type.
 - a. Exterior Finish: Stainless steel.
 - b. Interior Finish: Manufacturer's standard.
 - c. Doors: Full length.
 - d. Electrical Service: Equip unit with plug and cord for service indicated on Drawings.

2.5 MISCELLANEOUS MATERIALS

- A. Installation Accessories, General: NSF certified for end-use application indicated.
- B. Elastomeric Joint Sealant: ASTM C920; silicone. Type S (single component), Grade NS (nonsag), Class 25, Use NT (nontraffic) related to exposure, and Use M, G, A, or O as applicable to joint substrates indicated.
1. Public Health and Safety Requirements:
 - a. Sealant is certified for compliance with NSF standards for end-use application indicated.
 - b. Washed and cured sealant complies with the FDA's regulations for use in areas that come in contact with food.
 2. Cylindrical Sealant Backing: ASTM C1330, Type C, closed-cell polyethylene, in diameter greater than joint width.

2.6 FINISHES

- A. Stainless Steel Finishes:
1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - a. Run grain of directional finishes with long dimension of each piece.
 - b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
- B. Powder-Coat Finishes: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard, baked-polymer, thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install foodservice equipment level and plumb, according to manufacturer's written instructions.
 - 1. Connect equipment to utilities.
 - 2. Provide cutouts in equipment, neatly formed, where required to run service lines through equipment to make final connections.
- B. Complete equipment assembly where field assembly is required.
 - 1. Provide closed butt and contact joints that do not require a filler.
 - 2. Grind field welds on stainless steel equipment until smooth and polish to match adjacent finish.
- C. Install equipment with access and maintenance clearances that comply with manufacturer's written installation instructions and with requirements of authorities having jurisdiction.
- D. Install cabinets and similar equipment on bases in a bed of sealant.
- E. Install closure-trim strips and similar items requiring fasteners in a bed of sealant.
- F. Install joint sealant in joints between equipment and abutting surfaces with continuous joint backing unless otherwise indicated. Produce airtight, watertight, vermin-proof, sanitary joints.

3.2 CLEANING AND PROTECTING

- A. After completing installation of equipment, repair damaged finishes.
- B. Clean and adjust equipment as required to produce ready-for-use condition.
- C. Protect equipment from damage during remainder of the construction period.

3.3 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain foodservice equipment.

END OF SECTION 114000

SECTION 114580 - PULL DOWN STAIR

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide fire-rated pull-down stair including stair components, frame, and door as indicated on the drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related Work:
 - 1. Section 061000 "Rough Carpentry" and Section 061053 "Miscellaneous Rough Carpentry".

1.2 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are trained and experienced in the necessary crafts and who are thoroughly familiar with the specified requirements and the methods needed for proper performance of the work of this section.

1.3 ACTION SUBMITTALS

- A. Product Date: Within 30 calendar day after the Contractor has received the Owner's Notice to Proceed, submit:
 - 1. Material list of items proposed to be provided under this Section.
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
 - 3. Details of installation.
 - 4. Shop drawings showing size, location, dimensions and finishes according to the manufacturer's latest recommendations.
 - 5. Manufacturer's recommended installation procedures which, when approved in advance by the Architect, shall become the basis for accepting or rejecting the actual installation procedures used on the work.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Examine stair assembly when it arrived on site. Note the carrier and manufacturer of any damage.
- B. Store stair assembly in a protected location until installation. If stored outside, protect under a tarp or suitable cover on raised platform away from ground and surface soiling and moisture.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable manufacturer's for pull-down stair assembly may include the following: Confirm the existing conditions match the requirements of the stair assembly prior to ordering.
 - 1. Precision Ladders, LLC, Morristown TN;

2. Calvert USA, Inc., Solomons, MD;
3. American Stairways, Inc., Memphis, TN;
4. Fakro Stairs, Addison, IL; or
5. Approved Equal.

2.2 MATERIALS

- A. Provide other materials not specifically described but required for a complete and proper installation as selected by the Contractor and approved by the Architect.
- B. Doors:
1. Provide full-flush design in dimensions shown on drawings, and/or to work with existing framing.
 2. 1/8" aluminum door panel (standard) or 20-gauge steel door with 1-hour fire-rated label that meets ASTM E-119 and UBC 43-7 requirements, passed 250 degree temperature rise in the first 30 minutes.
 3. Steel piano hinges.
 4. Door overlaps bottom flange of frame. Fire-rated steel door is flush with bottom of frame.
 5. Eye bolt accommodated pole for opening and closing door.
- C. Stair Components:
1. Provide extruded aluminum channel stringers with steel blade type hinges and adjustable plastic foot.
 2. Provide aluminum treaded covered with nonskid safety material.
 3. Stair assembly shall have a minimum of 500 lb load rating.
 4. Stair assembly must fit within the area provided and reach to level ground when extended.
- D. Rail:
1. Provide hand/guardrail of 1 1/4" O.D. galvanized steel, both sides.
- E. Frame:
1. Provide 1/8" steel channel frame that is 5" deep.
- F. Hardware:
1. Steel blade-type hinge connecting stringer section, cadmium plated and chromate sealed, bolted to stringers.
 2. Steel operating arms, cadmium plated and chromate sealed.
 3. Double-acting steel springs and V-hooks.
 4. Rivets rated at 100# shear.
- G. Safety:
1. Steel bar handrail riveted to stringers, upper section, both sides.
 2. Steel section alignment clips at stringer section joints.
 3. Molded rubber guards at corners of aluminum door panel.
- H. Finishes:
1. Mill finish on aluminum stairway components.

2. Prime coat on frame.

I. Accessories:

1. Steel pole to aid opening and closing stair assembly. The pole shall be equipped with a hook on one end and a bicycle grip on the other.
2. Keyed lock for door as an option for the Owner.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Examine areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this section.
- B. Install stairway in its proper location, firmly anchored into position, level and plumb, and in accordance with the manufacturer's recommendations.

3.3 WARRANTIES

- A. Provide a limited warranty of one (1) year against defective material and workmanship.

END OF SECTION 114580

SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sleeves.
 - 2. Sleeve-seal systems.
 - 3. Grout.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
- C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- D. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Stainless steel.
 - 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
 - 2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - 2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
 - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 079200 "Joint Sealants."

- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
 - 1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller Than NPS 6: Cast-iron wall sleeves.
 - 2. Exterior Concrete Walls below Grade:
 - a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 3. Concrete Slabs-on-Grade:
 - a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 2) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
 - 4. Interior Partitions:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.

END OF SECTION 220517

SLEEVES AND SLEEVE SEALS FOR PLUMBING
PIPING

Restoration and Expansion
Historic Metlar-Bodine House
Piscataway, Middlesex County, NJ
Architects Project No.: 1836C

SECTION 220518 - ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Escutcheons.
 - 2. Floor plates.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
 - 1. Escutcheons for New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.

- b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
 - g. Bare Piping in Equipment Rooms: One-piece, cast-brass type with polished, chrome-plated finish.
- C. Install floor plates for piping penetrations of equipment-room floors.
- D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
- 1. New Piping: One-piece, floor-plate type.
- 3.2 FIELD QUALITY CONTROL
- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 220518

SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Bimetallic-actuated thermometers.
 - 2. Liquid-in-glass thermometers.
 - 3. Thermowells.
 - 4. Dial-type pressure gages.
 - 5. Gage attachments.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. Product certificates.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

- A. Standard: ASME B40.200.
- B. Case: Liquid-filled and sealed type(s); stainless steel with 5-inch nominal diameter.
- C. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F.
- D. Connector Type(s): Union joint, adjustable angle rigid, back and rigid, bottom, with unified-inch screw threads.
- E. Connector Size: 1/2 inch, with ASME B1.1 screw threads.
- F. Stem: 0.25 or 0.375 inch in diameter; stainless steel.
- G. Window: Plain glass.
- H. Ring: Stainless steel.

- I. Element: Bimetal coil.
- J. Pointer: Dark-colored metal.
- K. Accuracy: Plus or minus 1 percent of scale range.

2.2 LIQUID-IN-GLASS THERMOMETERS

- A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:
 - 1. Standard: ASME B40.200.
 - 2. Case: Cast aluminum; 7-inch nominal size unless otherwise indicated.
 - 3. Case Form: Adjustable angle unless otherwise indicated.
 - 4. Tube: Glass with magnifying lens and blue or red organic liquid.
 - 5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
 - 6. Window: Glass.
 - 7. Stem: Aluminum and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.
 - 8. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
 - 9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.
- B. Plastic-Case, Industrial-Style, Liquid-in-Glass Thermometers:
 - 1. Standard: ASME B40.200.
 - 2. Case: Plastic; 7-inch nominal size unless otherwise indicated.
 - 3. Case Form: Adjustable angle unless otherwise indicated.
 - 4. Tube: Glass with magnifying lens and blue or red organic liquid.
 - 5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
 - 6. Window: Glass.
 - 7. Stem: Aluminum, brass, or stainless steel and of length to suit installation.
 - a. Design for Thermowell Installation: Bare stem.
 - 8. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
 - 9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.3 PRESSURE GAGES

- A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:
 - 1. Standard: ASME B40.100.
 - 2. Case: Liquid-filled type(s); cast aluminum or drawn steel; 4-1/2-inch nominal diameter.
 - 3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
 - 4. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
 - 5. Movement: Mechanical, with link to pressure element and connection to pointer.

6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
7. Pointer: Dark-colored metal.
8. Window: Glass or plastic.
9. Ring: Brass.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

B. Direct-Mounted, Plastic-Case, Dial-Type Pressure Gages:

1. Standard: ASME B40.100.
2. Case: Sealed type; plastic; 4-1/2-inch nominal diameter.
3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
4. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
7. Pointer: Dark-colored metal.
8. Window: Glass or plastic.
9. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.4 GAGE ATTACHMENTS

- A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.
- B. Valves: Brass or stainless-steel needle, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install thermowells with socket extending a minimum of 2 inches into fluid and in vertical position in piping tees.
- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
- C. Install thermowells with extension on insulated piping.
- D. Fill thermowells with heat-transfer medium.
- E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
- F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

- G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- H. Install remote-mounted pressure gages on panel.
- I. Install valve and snubber in piping for each pressure gage for fluids.
- J. Install thermometers in the following locations:
 - 1. Inlet and outlet of each water heater.
 - 2. Inlet and outlet of each domestic hot-water storage tank.
- K. Install pressure gages in the following locations:
 - 1. Building water service entrance into building.
 - 2. Inlet and outlet of each pressure-reducing valve.
- L. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.
- M. Adjust faces of meters and gages to proper angle for best visibility.

END OF SECTION 220519

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Brass ball valves.
2. Bronze ball valves.
3. Iron, single-flange butterfly valves.
4. Bronze swing check valves.
5. Iron swing check valves.
6. Iron swing check valves with closure control.
7. Bronze gate valves.
8. Iron gate valves.
9. Bronze globe valves.
10. Iron globe valves.

B. Related Sections:

1. Division 22 plumbing piping Sections for specialty valves applicable to those Sections only.
2. Division 22 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
3. Division 33 water distribution piping Sections for general-duty and specialty valves for site construction piping.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of valve indicated.

1.3 QUALITY ASSURANCE

- A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
- B. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to valve schedule articles for applications of valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

- C. Valve Sizes: Same as upstream piping unless otherwise indicated.
- D. Valve Actuator Types:
 - 1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
 - 2. Handwheel: For valves other than quarter-turn types.
 - 3. Handlever: For quarter-turn valves NPS 6 and smaller except plug valves.
- E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
 - 1. Gate Valves: With rising stem.
 - 2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
 - 3. Butterfly Valves: With extended neck.
- F. Valve-End Connections:
 - 1. Flanged: With flanges according to ASME B16.1 for iron valves.
 - 2. Solder Joint: With sockets according to ASME B16.18.
 - 3. Threaded: With threads according to ASME B1.20.1.

2.2 BRONZE BALL VALVES

- A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Valve, Inc.
 - b. Conbraco Industries, Inc.; Apollo Valves.
 - c. NIBCO INC.
 - 2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig.
 - c. CWP Rating: 600 psig.
 - d. Body Design: Two piece.
 - e. Body Material: Bronze.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Bronze.
 - i. Ball: Chrome-plated brass.
 - j. Port: Full.

2.3 BRONZE SWING CHECK VALVES

- A. Class 125, Bronze Swing Check Valves with Bronze Disc:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. American Valve, Inc.
- b. Crane Co.; Crane Valve Group; Crane Valves.
- c. NIBCO INC.
- 2. Description:
 - a. Standard: MSS SP-80, Type 3.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded.
 - f. Disc: Bronze.

2.4 IRON SWING CHECK VALVES

- A. Class 125, Iron Swing Check Valves with Metal Seats:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crane Co.; Crane Valve Group; Jenkins Valves.
 - b. NIBCO INC.
 - c. Powell Valves.
 - 2. Description:
 - a. Standard: MSS SP-71, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Clear or full waterway.
 - d. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - e. Ends: Flanged.
 - f. Trim: Bronze.
 - g. Gasket: Asbestos free.

2.5 IRON SWING CHECK VALVES WITH CLOSURE CONTROL

- A. Class 125, Iron Swing Check Valves with Lever- and Spring-Closure Control:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. NIBCO INC.
 - 2. Description:
 - a. Standard: MSS SP-71, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Clear or full waterway.
 - d. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - e. Ends: Flanged.
 - f. Trim: Bronze.
 - g. Gasket: Asbestos free.
 - h. Closure Control: Factory-installed, exterior lever and spring.

2.6 IRON GATE VALVES

- A. Class 125, NRS, Iron Gate Valves:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Milwaukee Valve Company.
 - c. NIBCO INC.
 - d. Powell Valves.
 - e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 2. Description:
 - a. Standard: MSS SP-70, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - d. Ends: Flanged.
 - e. Trim: Bronze.
 - f. Disc: Solid wedge.
 - g. Packing and Gasket: Asbestos free.
- B. Class 125, OS&Y, Iron Gate Valves:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Milwaukee Valve Company.
 - b. NIBCO INC.
 - c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 2. Description:
 - a. Standard: MSS SP-70, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - d. Ends: Flanged.
 - e. Trim: Bronze.
 - f. Disc: Solid wedge.
 - g. Packing and Gasket: Asbestos free.

2.7 BRONZE GLOBE VALVES

- A. Class 125, Bronze Globe Valves with Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Milwaukee Valve Company.
 - b. NIBCO INC
 - c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 2. Description:

- a. Standard: MSS SP-80, Type 1.
- b. CWP Rating: 200 psig.
- c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
- d. Ends: Threaded or solder joint.
- e. Stem and Disc: Bronze.
- f. Packing: Asbestos free.
- g. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.

3.2 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball valves.
 - 2. Throttling Service: Globe or ball valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 - 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
 - 4. For Steel Piping, NPS 2 and Smaller: Threaded ends.
 - 5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 6. For Steel Piping, NPS 5 and Larger: Flanged ends.

3.4 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
 - 1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
 - 2. Bronze Angle Valves: Class 125, bronze disc.
 - 3. Ball Valves: Two piece, full port, brass with brass trim.
 - 4. Bronze Swing Check Valves: Class 125, bronze disc.
 - 5. Bronze Gate Valves: Class 125, NRS.
 - 6. Bronze Globe Valves: Class 125, bronze disc.

- B. Pipe NPS 2-1/2 and Larger:
 - 1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
 - 2. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.
 - 3. Iron Swing Check Valves: Class 125, metal seats.
 - 4. Iron Swing Check Valves with Closure Control: Class 125, lever and spring.
 - 5. Iron Gate Valves: Class 125, NRS.
 - 6. Iron Globe Valves: Class 125.

3.5 SANITARY-WASTE AND STORM-DRAINAGE VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
 - 1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
 - 2. Ball Valves: One piece, full port, brass with brass trim.
 - 3. Bronze Swing Check Valves: Class 125, bronze disc.
 - 4. Bronze Gate Valves: Class 125, NRS.
 - 5. Bronze Globe Valves: Class 125, bronze disc.

- B. Pipe NPS 2-1/2 and Larger:
 - 1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
 - 2. Iron Swing Check Valves: Class 125, metal seats.
 - 3. Iron Swing Check Valves with Closure Control: Class 125, lever and spring.
 - 4. Iron Gate Valves: Class 125, NRS.
 - 5. Iron Globe Valves: Class 125.

END OF SECTION 220523

SECTION 220523.12 - BALL VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Brass ball valves.
 - 2. Bronze ball valves.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
 - 1. Certification that products comply with NSF 61 and NSF 372.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded end valves.
 - 2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 3. ASME B16.18 for solder-joint connections.
 - 4. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
 - 1. Gear Actuator: For quarter-turn valves NPS 4 and larger.
 - 2. Handlever: For quarter-turn valves smaller than NPS 4.
- H. Valves in Insulated Piping:
 - 1. Include 2-inch stem extensions.
 - 2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
 - 3. Memory stops that are fully adjustable after insulation is applied.

2.2 BRONZE BALL VALVES

- A. Two-Piece, Bronze Ball Valves with Full Port, and Bronze or Brass Trim:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.
 - b. Milwaukee Valve Company.
 - c. NIBCO INC.
 - 2. Description:
 - a. Standard: MSS SP-110.
 - b. CWP Rating: 600 psig.
 - c. Body Design: Two piece.
 - d. Body Material: Bronze.
 - e. Ends: Threaded and soldered.
 - f. Seats: PTFE.
 - g. Stem: Bronze or brass.
 - h. Ball: Chrome-plated brass.
 - i. Port: Full.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.

3.2 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- B. Select valves with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 - 2. For Steel Piping, NPS 2 and Smaller: Threaded ends.

3.3 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
 - 1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
 - 2. One piece, brass ball valve.

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3. One piece, bronze ball valve with bronze trim.
4. Two-piece, bronze ball valves with full port and bronze or brass trim.

END OF SECTION 220523.12

SECTION 220523.14 - CHECK VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Bronze swing check valves.
 - 2. Iron swing check valves.
 - 3. Iron swing check valves with closure control.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
 - 1. Certification that products comply with NSF 61 and NSF 372.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded end valves.
 - 2. ASME B16.1 for flanges on iron valves.
 - 3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 4. ASME B16.18 for solder joint.
 - 5. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE SWING CHECK VALVES

- A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Milwaukee Valve Company.
 - b. NIBCO INC.
 - c. Watts; a Watts Water Technologies company.
2. Description:
 - a. Standard: MSS SP-80, Type 3.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded or soldered. See valve schedule articles.
 - f. Disc: Bronze.

B. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Milwaukee Valve Company.
 - b. NIBCO INC.
 - c. Watts; a Watts Water Technologies company.
2. Description:
 - a. Standard: MSS SP-80, Type 4.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded or soldered. See valve schedule articles.
 - f. Disc: PTFE.

2.3 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Milwaukee Valve Company.
 - b. NIBCO INC.
 - c. Watts; a Watts Water Technologies company.
2. Description:
 - a. Standard: MSS SP-71, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Clear or full waterway.
 - d. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - e. Ends: Flanged or threaded. See valve schedule articles.
 - f. Trim: Bronze.
 - g. Gasket: Asbestos free.

B. Class 125, Iron Swing Check Valves with Nonmetallic-to-Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane; Crane Energy Flow Solutions.
 - b. Stockham; Crane Energy Flow Solutions.
2. Description:
 - a. Standard: MSS SP-71, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Clear or full waterway.
 - d. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - e. Ends: Flanged or threaded. See valve schedule articles.
 - f. Trim: Composition.
 - g. Seat Ring: Bronze.
 - h. Disc Holder: Bronze.
 - i. Disc: PTFE.
 - j. Gasket: Asbestos free.

2.4 IRON SWING CHECK VALVES WITH CLOSURE CONTROL

- A. Class 125, Iron Swing Check Valves with Lever- and Spring-Closure Control:
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. NIBCO INC.
 2. Description:
 - a. Standard: MSS SP-71, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Clear or full waterway.
 - d. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - e. Ends: Flanged or threaded. See valve schedule articles.
 - f. Trim: Bronze.
 - g. Gasket: Asbestos free.
 - h. Closure Control: Factory-installed exterior lever and spring.
- B. Class 125, Iron Swing Check Valves with Lever and Weight-Closure Control:
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Milwaukee Valve Company.
 - b. NIBCO INC.
 - c. Watts; a Watts Water Technologies company.
 2. Description:
 - a. Standard: MSS SP-71, Type I.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Clear or full waterway.
 - d. Body Material: ASTM A 126, gray iron with bolted bonnet.
 - e. Ends: Flanged or threaded. See valve schedule articles.
 - f. Trim: Bronze.
 - g. Gasket: Asbestos free.

- h. Closure Control: Factory-installed exterior lever and weight.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install swing check valves for proper direction of flow in horizontal position with hinge pin level.

3.2 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Pump-Discharge Check Valves:
 - a. NPS 2 and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
 - b. NPS 2-1/2 and Larger for Domestic Water: Iron swing check valves with lever and weight or spring; metal-seat or resilient-seat check valves.
 - c. NPS 2-1/2 and Larger for Sanitary Waste and Storm Drainage: Iron swing check valves with lever and weight or spring.
- B. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- C. End Connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded or soldered.
 - 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged or threaded.
 - 3. For Copper Tubing, NPS 5 and Larger: Flanged.
 - 4. For Steel Piping, NPS 2 and Smaller: Threaded.
 - 5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged or threaded.
 - 6. For Steel Piping, NPS 5 and Larger: Flanged.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller: Bronze swing check valves, Class 125, bronze disc with soldered or threaded end connections.
- B. Pipe NPS 2-1/2 and Larger:
 - 1. Iron swing check valves, Class 125, metal seats with threaded or flanged end connections.
 - 2. Iron swing check valves with closure control, Class 125, lever and spring with threaded or flanged end connections.

END OF SECTION 220523.14

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe positioning systems.
6. Equipment supports.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:
1. Trapeze pipe hangers.

2. Equipment supports.

- C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

- B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

- A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.
- B. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig minimum compressive strength.
- C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.6 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.7 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-

1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

- K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- M. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
 - 5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.

6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- G. Use padded hangers for piping that is subject to scratching.
- H. Use thermal-hanger shield inserts for insulated piping and tubing.
- I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 - 4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 - 6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.

7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
 9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
- J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
- L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.

7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
- O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- P. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.
- Q. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
 - 1. Material and Thickness: Brass, 0.032-inch aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Letter Color: White.
 - 3. Background Color: Blue.
 - 4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 - 5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
 - 6. Fasteners: Stainless-steel rivets or self-tapping screws.
 - 7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Plastic Labels for Equipment:
 - 1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch insert dimension thick, and having predrilled holes for attachment hardware.
 - 2. Letter Color: White.
 - 3. Background Color: Blue.
 - 4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 - 5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 - 6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger

lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping.

PART 3 - EXECUTION

3.1 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.2 PIPE LABEL INSTALLATION

A. Piping Color Coding: Painting of piping is specified in Section 099123 "Interior Painting."

B. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

IDENTIFICATION FOR PLUMBING PIPING AND
EQUIPMENT

Restoration and Expansion
Historic Metlar-Bodine House
Piscataway, Middlesex County, NJ
Architects Project No.: 1836C

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:

1. Domestic Water Piping
 - a. Background: Safety green.
 - b. Letter Colors: White.
2. Sanitary Waste and Storm Drainage Piping:
 - a. Background Color: Safety white.
 - b. Letter Color: Black.

END OF SECTION 220553

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulating the following plumbing piping services:
 - 1. Domestic cold and hot-water piping.
 - 2. Domestic recirculating hot-water piping.
 - 3. Sanitary waste piping exposed to freezing conditions.
 - 4. Storm-water piping exposed to freezing conditions.
 - 5. Roof drains and rainwater leaders.
 - 6. Supplies and drains for handicap-accessible lavatories and sinks.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail attachment and covering of heat tracing inside insulation.
 - 3. Detail insulation application at pipe expansion joints for each type of insulation.
 - 4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - 5. Detail removable insulation at piping specialties, equipment connections, and access panels.
 - 6. Detail application of field-applied jackets.
 - 7. Detail application at linkages of control devices.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
- B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 - 1. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Pittsburgh Corning Corporation.
 - 2. Special-Shaped Insulation: ASTM C 552, Type III.
 - 3. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
 - 4. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- E. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville; a Berkshire Hathaway company.

- b. Manson Insulation Inc.
 - c. Owens Corning.
2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- 2.2 INSULATING CEMENTS
- A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.
- 2.3 ADHESIVES
- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
 - B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 - D. PVC Jacket Adhesive: Compatible with PVC jacket.
- 2.4 MASTICS
- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
 - B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
 - 1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 - 4. Color: White.
 - C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
 - 1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 3. Solids Content: 60 percent by volume and 66 percent by weight.

4. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F.
4. Color: White or gray.
5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

2.8 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 - 1. Width: 3 inches.
 - 2. Thickness: 11.5 mils.
 - 3. Adhesion: 90 ounces force/inch in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch in width.
 - 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

2.9 SECUREMENTS

- A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- C. Wire: 0.080-inch nickel-copper alloy.

2.10 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers:
 - 1. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.

2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Cleanouts.

3.3 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 4. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- E. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."
- 3.4 GENERAL PIPE INSULATION INSTALLATION
- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly

against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
 4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.6 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

- D. Do not field paint aluminum or stainless-steel jackets.

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.

- B. Tests and Inspections:

- 1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.8 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

- 1. Drainage piping located in crawl spaces.
- 2. Underground piping.
- 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.9 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Cols, Hot and Recirculated Hot Water: Insulation shall be one of the following:

- 1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

- B. Stormwater and Overflow: Insulation shall be one of the following:

- 1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

- C. Roof Drain and Overflow Drain Bodies: Insulation shall be one of the following:

- 1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

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- D. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities: Insulation shall be one of the following:
 - 1. Polyolefin: 1/2 inch thick.
- E. Sanitary Waste Piping Where Heat Tracing Is Installed: Mineral-fiber, preformed pipe insulation, Type I, 1-1/2 inches thick.

3.10 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Piping, Concealed:
 - 1. None.
 - 2. PVC: 20 mils thick.
- D. Piping, Exposed:
 - 1. None.
 - 2. PVC: 20 mils thick.

END OF SECTION 220719

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

1.2 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

1.3 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14, NSF 61 and NSF 372. Plastic piping components shall be marked with "NSF-pw."

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- E. Copper Unions:
 - 1. MSS SP-123.
 - 2. Cast-copper-alloy, hexagonal-stock body.
 - 3. Ball-and-socket, metal-to-metal seating surfaces.
 - 4. Solder-joint or threaded ends.

F. Copper Pressure-Seal-Joint Fittings:

1. Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
2. Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

2.3 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe:

1. AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Standard-Pattern, Mechanical-Joint Fittings:

1. AWWA C110/A21.10, ductile or gray iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

C. Compact-Pattern, Mechanical-Joint Fittings:

1. AWWA C153/A21.53, ductile iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.4 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

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- E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.5 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2.6 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Standard: ASSE 1079.
2. Pressure Rating: 125 psig minimum at 180 deg F.
3. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Standard: ASSE 1079.
2. Factory-fabricated, bolted, companion-flange assembly.
3. Pressure Rating: 125 psig minimum at 180 deg F.
4. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.
- D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."
- E. Install shutoff valve immediately upstream of each dielectric fitting.
- F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."
- G. Install domestic water piping level without pitch and plumb.
- H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- I. Install seismic restraints on piping.
- J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- K. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- M. Install piping to permit valve servicing.
- N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- O. Install piping free of sags and bends.

- P. Install fittings for changes in direction and branch connections.
- Q. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- R. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping."
- S. Install thermostats in hot-water circulation piping.
- T. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."
- U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Braze Joints" chapter.
- E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

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- G. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- H. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
 - 1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
 - 2. Fittings for NPS 2 and Larger: Sleeve-type coupling.
- C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.5 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flange kits.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.

4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
- E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 4. NPS 2-1/2: 108 inches with 1/2-inch rod.
 5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
 6. NPS 6: 10 feet with 5/8-inch rod.
 7. NPS 8: 10 feet with 3/4-inch rod.
- F. Install supports for vertical copper tubing every 10 feet.
- G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/4 and Smaller: 84 inches with 3/8-inch rod.
 2. NPS 1-1/2: 108 inches with 3/8-inch rod.
 3. NPS 2: 10 feet with 3/8-inch rod.
 4. NPS 2-1/2: 11 feet with 1/2-inch rod.
 5. NPS 3 and NPS 3-1/2: 12 feet with 1/2-inch rod.
 6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
 7. NPS 6: 12 feet with 3/4-inch rod.
 8. NPS 8 to NPS 12: 12 feet with 7/8-inch rod.
- H. Install supports for vertical steel piping every 15 feet.
- I. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 - 1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
 - 3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Piping Inspections:
 - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

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- c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
- d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
- c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
- d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.10 ADJUSTING

A. Perform the following adjustments before operation:

- 1. Close drain valves, hydrants, and hose bibbs.
- 2. Open shutoff valves to fully open position.
- 3. Open throttling valves to proper setting.
- 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
- 5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
- 6. Remove and clean strainer screens. Close drain valves and replace drain plugs.

7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Repeat procedures if biological examination shows contamination.
 - e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be the following:

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1. Soft copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.
- E. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:
1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and soldered joints.
 2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
- F. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be one of the following:
1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and soldered joints.
 2. Hard copper tube, ASTM B 88, Type L; copper pressure-seal-joint fittings; and pressure-sealed joints.
 3. Hard copper tube, ASTM B 88, Type L; grooved-joint, copper-tube appurtenances; and grooved joints.
 4. Galvanized-steel pipe and nipples; galvanized, gray-iron threaded fittings; and threaded joints.

END OF SECTION 221116

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Strainers.
6. Hose bibbs.
7. Wall hydrants.
8. Drain valves.
9. Water-hammer arresters.
10. Trap-seal primer valves.

B. Related Requirements:

1. Section 220519 "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.
2. Section 221116 "Domestic Water Piping" for water meters.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Potable-water piping and components shall comply with NSF 61 and NSF 372.

2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Standard: ASSE 1001.
2. Size: NPS 1/4 to NPS 3, as required to match connected piping.
3. Body: Bronze.
4. Inlet and Outlet Connections: Threaded.
5. Finish: Chrome plated.

- B. Hose-Connection Vacuum Breakers:

1. Standard: ASSE 1011.
2. Body: Bronze, nonremovable, with manual drain.
3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
4. Finish: Chrome or nickel plated.

2.4 BACKFLOW PREVENTERS

- A. Reduced-Pressure-Principle Backflow Preventers:

1. Standard: ASSE 1013.
2. Operation: Continuous-pressure applications.
3. Pressure Loss: 12 psig maximum, through middle third of flow range.
4. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
5. Accessories:

- a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
- b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
- c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

2.5 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Standard: ASSE 1003.
2. Pressure Rating: Initial working pressure of 150 psig.
3. Design Flow Rate: 125.
4. Design Inlet Pressure: 85.
5. Design Outlet Pressure Setting: 65.
6. Body: Bronze with chrome-plated finish for NPS 2 and smaller; cast iron for NPS 2-1/2 and NPS 3.
7. Valves for Booster Heater Water Supply: Include integral bypass.
8. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

2.6 BALANCING VALVES

A. Memory-Stop Balancing Valves:

1. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 2 or smaller.
4. Body: Copper alloy.
5. Port: Standard or full port.
6. Ball: Chrome-plated brass.
7. Seats and Seals: Replaceable.
8. End Connections: Solder joint or threaded.
9. Handle: Vinyl-covered steel with memory-setting device.

2.7 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:
 - a. Strainers NPS 2 and Smaller: 0.020 inch.
 - b. Strainers NPS 2-1/2 to NPS 4: 0.045 inch.
6. Drain: Pipe plug.

2.8 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Chrome or nickel plated.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Wheel handle.
13. Operation for Finished Rooms: Wheel handle.

14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.9 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:

1. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
2. Pressure Rating: 125 psig.
3. Operation: Loose key.
4. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
5. Inlet: NPS 3/4 or NPS 1.
6. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
7. Box: Deep, flush mounted with cover.
8. Box and Cover Finish: Polished nickel bronze.
9. Operating Keys(s): Two with each wall hydrant.

B. Vacuum Breaker Wall Hydrants:

1. Standard: ASSE 1019, Type A or Type B.
2. Type: Freeze-resistant, automatic draining with integral air-inlet valve.
3. Classification: Type A, for automatic draining with hose removed or Type B, for automatic draining with hose removed or with hose attached and nozzle closed.
4. Pressure Rating: 125 psig.
5. Operation: Loose key or wheel handle.
6. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
7. Inlet: NPS 1/2 or NPS 3/4.
8. Outlet: Exposed with garden-hose thread complying with ASME B1.20.7.

2.10 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.11 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters <Insert drawing designation if any>:

1. Standard: ASSE 1010 or PDI-WH 201.
2. Type: Copper tube with piston.
3. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.12 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:

1. Standard: ASSE 1018.
2. Pressure Rating: 125 psig minimum.
3. Body: Bronze.
4. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
5. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
6. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

- B. Drainage-Type, Trap-Seal Primer Device:
 - 1. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 minimum, trap makeup connection.
 - 2. Size: NPS 1-1/4 minimum.
 - 3. Material: Chrome-plated, cast brass.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
 - 1. Locate backflow preventers in same room as connected equipment or system.
 - 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
 - 3. Do not install bypass piping around backflow preventers.
- B. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.
- C. Install balancing valves in locations where they can easily be adjusted.
 - 1. Install cabinet-type units recessed in or surface mounted on wall as specified.
- D. Install Y-pattern strainers for water on supply side of each water pressure-reducing valve.
- E. Install water-hammer arresters in water piping according to PDI-WH 201.
- F. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.2 CONNECTIONS

- A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:

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1. Test each pressure vacuum breaker and reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.
 - B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.
 - C. Prepare test and inspection reports.
- 3.4 ADJUSTING
- A. Set field-adjustable pressure set points of water pressure-reducing valves.
 - B. Set field-adjustable flow set points of balancing valves.
 - C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION 221119

SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pipe, tube, and fittings.
 - 2. Specialty pipe fittings.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- C. Adhesive Primer: ASTM F 656.
- D. Solvent Cement: ASTM D 2564.

2.3 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
3. Shielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1460.
 - b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.

- H. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- I. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- J. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
 - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- K. Install aboveground PVC piping according to ASTM D 2665.
- L. Install underground PVC piping according to ASTM D 2321.
- M. Plumbing Specialties:
 - 1. Install backwater valves in sanitary waste gravity-flow piping. Comply with requirements for backwater valves specified in Section 221319 "Sanitary Waste Piping Specialties."
 - 2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
 - 3. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."
- N. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- O. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

- P. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- Q. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.
- B. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
 - 1. Install transition couplings at joints of piping with small differences in OD's.
 - 2. In Drainage Piping: Shielded, nonpressure transition couplings.

3.5 VALVE INSTALLATION

- A. Backwater Valves: Install backwater valves in piping subject to backflow.
 - 1. Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.
 - 2. Floor Drains: Drain outlet backwater valves unless drain has integral backwater valve.
 - 3. Install backwater valves in accessible locations.
 - 4. Comply with requirements for backwater valve specified in Section 221319 "Sanitary Waste Piping Specialties."

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

- B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 3. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
 4. Vertical Piping: MSS Type 8 or Type 42, clamps.
 5. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 6. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 7. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
 2. NPS 3: 48 inches with 1/2-inch rod.
 3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
 4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
- G. Install supports for vertical PVC piping every 48 inches.
- H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
 - 5. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Make connections according to the following unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 6. Prepare reports for tests and required corrective action.
- 3.10 CLEANING AND PROTECTION
- A. Clean interior of piping. Remove dirt and debris as work progresses.
 - B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.11 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 and smaller shall be the following:
 - 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 - 2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- C. Aboveground, soil and waste piping NPS 5 and larger shall be the following:
 - 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 - 2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- D. Aboveground, vent piping NPS 4 and smaller shall be the following:
 - 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 - 2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- E. Underground, soil, waste, and vent piping NPS 4 and smaller shall be the following:
 - 1. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 - 2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- F. Underground, soil and waste piping NPS 5 and larger shall be the following:
 - 1. Solid-wall PVC pipe; PVC socket fittings; and solvent-cemented joints.
 - 2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION 221316

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cleanouts.
 - 2. Floor drains.
 - 3. Roof flashing assemblies.
 - 4. Miscellaneous sanitary drainage piping specialties.
 - 5. Flashing materials.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

1.3 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 CLEANOUTS

- A. Exposed Cast-Iron Cleanouts:
 - 1. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
 - 2. Size: Same as connected drainage piping
 - 3. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
 - 4. Closure: Countersunk or raised-head, brass plug.
 - 5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
- B. Cast-Iron Floor Cleanouts:

1. Standard: ASME A112.36.2M for adjustable housing cleanout.
2. Size: Same as connected branch.
3. Type: Adjustable housing.
4. Body or Ferrule: Cast iron.
5. Closure: Brass plug with straight threads and gasket.
6. Adjustable Housing Material: Cast iron with set-screws or other device.
7. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
8. Frame and Cover Shape: Round.

C. Cast-Iron Wall Cleanouts:

1. Standard: ASME A112.36.2M. Include wall access.
2. Size: Same as connected drainage piping.
3. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
4. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
5. Wall Access: Round, deep, chrome-plated bronze cover plate with screw.
6. Wall Access: Round, wall-installation frame and cover.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Standard: ASME A112.6.3.
2. Pattern: Floor drain.
3. Body Material: Gray iron.
4. Anchor Flange: Not required.
5. Outlet: Bottom type.
6. Sediment Bucket: Not required.
7. Top Shape: Round.

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch- thick, lead flashing collar and skirt extending at least 8 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
 - a. Open-Top Vent Cap: Without cap.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.
 - a. NPS 2: 4-inch- minimum water seal.
 - b. NPS 2-1/2 and Larger: 5-inch- minimum water seal.

B. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

C. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

D. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inch above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

E. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

F. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

2.5 FLASHING MATERIALS

- A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:
1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
 2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
 3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.
- B. Fasteners: Metal compatible with material and substrate being fastened.
- C. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
- D. Solder: ASTM B 32, lead-free alloy.
- E. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 45 degrees.
 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
 4. Locate at base of each vertical soil and waste stack.
- B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
1. Position floor drains for easy access and maintenance.
 2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
 - a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
 - b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
 - c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
 4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- E. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.
- F. Install deep-seal traps on floor drains and other waste outlets, if indicated.
- G. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 2. Size: Same as floor drain inlet.

- H. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
- I. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
- J. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

- A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

- A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
 - 1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
 - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
 - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
 - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.
- C. Set flashing on floors and roofs in solid coating of bituminous cement.
- D. Secure flashing into sleeve and specialty clamping ring or device.
- E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 076200 "Sheet Metal Flashing and Trim."
- F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 LABELING AND IDENTIFYING

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each grease interceptor.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.5 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 223400 - FUEL-FIRED, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Commercial, power-burner, gas-fired, Tankless, domestic-water heaters.
2. Domestic-water heater accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of domestic-water heater indicated.

B. Shop Drawings:

1. Wiring Diagrams: For power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.

C. Source quality-control reports.

D. Field quality-control reports.

E. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE/IESNA Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IESNA 90.1.
- C. ASME Compliance:
 - 1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Periods: From date of Substantial Completion.
 - a. Commercial, Gas-Fired, Domestic-Water Heaters:
 - 1) Heat Exchanger: Fifteen years.
 - 2) Controls and Other Components: Three years.

PART 2 - PRODUCTS

2.1 COMMERCIAL, FINNED-TUBE, GAS-FIRED, DOMESTIC-WATER HEATERS

- A. Commercial, Tankless, Gas-Fired, Domestic-Water Heaters:
 - 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. **Bradford White Corporation.**
 - b. **Navien.**
 - c. **Smith, A. O. Corporation.**

2. Standard: ANSI Z21.13/CSA 4.9 for hot-water-supply boilers.
 3. Description: Packaged unit with boiler, storage tank, pump, piping, and controls.
 4. Boiler Construction: ASME code with 160-psig working-pressure rating for hot-water-boiler-type, domestic-water heater.
 - a. Heat Exchanger: Horizontal, dual stainless steel headers.
 - b. Connections: Factory fabricated of materials compatible with boiler. Attach to boiler before testing.
 - 1) NPS 2 and Smaller: Threaded ends according to ASME B1.20.1.
- B. Capacity and Characteristics: (Refer to Plumbing Equipment Schedule on drawing.)

2.2 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. **AMTROL, Inc.**
 - b. **Flexcon Industries.**
 - c. **Honeywell Water Controls.**
 2. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
 3. Construction:
 - a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
 - b. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
 - c. Air-Charging Valve: Factory installed.
 4. Capacity and Characteristics: (Refer to Plumbing Equipment Schedule on drawing.)
- B. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.

- C. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1-M, manually operated. Furnish for installation in piping.
- D. Automatic Gas Valves: ANSI Z21.21/CSA 6.5, appliance, electrically operated, on-off automatic valve.
- E. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.
 - 1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.
- F. Pressure Relief Valves: Include pressure setting less than domestic-water heater working-pressure rating.
 - 1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.
- G. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4-M.
- H. Domestic-Water Heater Mounting Brackets: Manufacturer's factory-fabricated steel bracket for wall mounting, capable of supporting domestic-water heater and water.

2.3 SOURCE QUALITY CONTROL

- A. Factory Tests: Test and inspect assembled domestic-water heaters specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.
- B. Hydrostatically test commercial domestic-water heaters to minimum of one and one-half times pressure rating before shipment.
- C. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.
- D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

- A. Install domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
 - 1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping. Comply with requirements for shutoff valves specified in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping."
- B. Install gas-fired, domestic-water heaters according to NFPA 54.
 - 1. Install gas shutoff valves on gas supply piping to gas-fired, domestic-water heaters without shutoff valves.
 - 2. Install gas pressure regulators on gas supplies to gas-fired, domestic-water heaters without gas pressure regulators if gas pressure regulators are required to reduce gas pressure at burner.
 - 3. Install automatic gas valves on gas supplies to gas-fired, domestic-water heaters if required for operation of safety control.
 - 4. Comply with requirements for gas shutoff valves, gas pressure regulators, and automatic gas valves specified in Section 231123 "Facility Natural-Gas Piping."
- C. Install combination temperature-and-pressure relief valves in water piping for domestic-water heaters without storage. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- D. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."
- E. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Section 220519 "Meters and Gages for Plumbing Piping."
- F. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.
- G. Fill domestic-water heaters with water.

- H. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

- A. Comply with requirements for domestic-water piping specified in Section 221116 "Domestic Water Piping."
- B. Comply with requirements for gas piping specified in Section 231123 "Facility Natural-Gas Piping."
- C. Drawings indicate general arrangement of piping, fittings, and specialties.
- D. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

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- C. Prepare test and inspection reports.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial, gas-fired, domestic-water heaters.

END OF SECTION 223400

SECTION 224000 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Faucets for lavatories and sinks.
 - 2. Toilet seats.
 - 3. Protective shielding guards.
 - 4. Fixture supports.
 - 5. Water closets.
 - 6. Lavatories.
 - 7. Kitchen sinks.
 - 8. Service sinks.

1.2 DEFINITIONS

- A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- B. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities" for plumbing fixtures for people with disabilities.

- C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- E. LEAD FREE REQUIREMENT: Products designed for dispensing potable water shall meet NSF 61 and NSF 372 test standards via third-party testing and certification.
- F. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- G. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
 - 1. Plastic Sinks: ANSI Z124.6.
 - 2. Solid-Surface-Material Lavatories and Sinks: ANSI/ICPA SS-1.
 - 3. Vitreous-China Fixtures: ASME A112.19.2M.
 - 4. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.
 - 5. Water-Closet, Flushometer Tank Trim: ASSE 1037.
- H. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
 - 1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
 - 2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
 - 3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
 - 4. Faucets: ASME A112.18.1.
 - 5. Hose-Connection Vacuum Breakers: ASSE 1011.
 - 6. Hose-Coupling Threads: ASME B1.20.7.
 - 7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
 - 8. NSF Potable-Water Materials: NSF 61.
 - 9. Pipe Threads: ASME B1.20.1.
 - 10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
 - 11. Supply Fittings: ASME A112.18.1.
 - 12. Brass Waste Fittings: ASME A112.18.2.
- I. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
 - 1. Atmospheric Vacuum Breakers: ASSE 1001.
 - 2. Brass and Copper Supplies: ASME A112.18.1.
 - 3. Manual-Operation Flushometers: ASSE 1037.
 - 4. Brass Waste Fittings: ASME A112.18.2.
 - 5. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.
- J. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Flexible Water Connectors: ASME A112.18.6.
2. Grab Bars: ASTM F 446.
3. Hose-Coupling Threads: ASME B1.20.7.
4. Hot-Water Dispensers: ASSE 1023 and UL 499.
5. Off-Floor Fixture Supports: ASME A112.6.1M.
6. Pipe Threads: ASME B1.20.1.
7. Plastic Toilet Seats: ANSI Z124.5.
8. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 LAVATORY FAUCETS

- A. Lavatory Faucets, (Refer to Plumbing Fixture Schedule on drawings):
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Sloan Valve Company.
 - b. Bradley Corporation.
 - c. Chicago Faucets.
 - d. Symmons Industries, Inc.

2.2 SINK FAUCETS

- A. Sink Faucets, (Refer to Plumbing Fixture Schedule on drawings):
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Standard Companies, Inc.
 - b. Bradley Corporation.
 - c. Chicago Faucets.
 - d. Symmons Industries, Inc.

2.3 TOILET SEATS

- A. Toilet Seats, (Refer to Plumbing Fixture Schedule on drawings):
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Standard Companies, Inc.
 - b. Bemis Manufacturing Company.
 - c. Centoco Manufacturing Corp.

- d. Church Seats.
- e. Eljer.

2.4 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers, (Refer to Plumbing Fixture Schedule on drawings):
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Engineered Brass Co.
 - b. Plumberex Specialty Products Inc.
 - c. TRUEBRO, Inc.
 - d. Zurn Plumbing Products Group; Tubular Brass Plumbing Products Operation.

2.5 FIXTURE SUPPORTS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Josam Company.
 - 2. MIFAB Manufacturing Inc.
 - 3. Smith, Jay R. Mfg. Co.
 - 4. Tyler Pipe; Wade Div.
 - 5. Watts Drainage Products Inc.; a div. of Watts Industries, Inc.
 - 6. Zurn Plumbing Products Group; Specification Drainage Operation.
- C. Lavatory Supports:
 - 1. Description: Type II, lavatory carrier with concealed arms and tie rod for wall-mounting, lavatory-type fixture. Include steel uprights with feet.
 - 2. Accessible-Fixture Support: Include rectangular steel uprights.

2.6 WATER CLOSETS

- A. Water Closets, (Refer to Plumbing Fixture Schedule on drawings):
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Standard Companies, Inc.
 - b. Crane Plumbing, L.L.C./Fiat Products.
 - c. Kohler Co.

- d. TOTO USA, Inc.

2.7 LAVATORIES

- A. Lavatories, (Refer to Plumbing Fixture Schedule on drawings):
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Standard Companies, Inc.
 - b. Crane Plumbing, L.L.C./Fiat Products.
 - c. Kohler Co.
 - d. TOTO USA, Inc.

2.8 KITCHEN SINKS

- A. Kitchen Sinks, (Refer to Plumbing Fixture Schedule on drawings):
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dayton Products, Inc.
 - b. Elkay Manufacturing Co.
 - c. Kohler Co.
 - d. Sterling Plumbing Group, Inc.

2.9 SERVICE SINKS

- A. Service Sinks, (Refer to Plumbing Fixture Schedule on drawings):
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Standard Companies, Inc.
 - b. Commercial Enameling Company.
 - c. Crane Plumbing, L.L.C./Fiat Products.
 - d. Eljer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

- B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.
 - 1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
 - 2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
 - 3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- C. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
- D. Install wall-mounting fixtures with tubular waste piping attached to supports.
- E. Install fixtures level and plumb according to roughing-in drawings.
- F. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
- G. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- H. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
- I. Install toilet seats on water closets.
- J. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- K. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.
- L. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- M. Install traps on fixture outlets.
 - 1. Exception: Omit trap on fixtures with integral traps.
 - 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
- N. Install escutcheons at piping wall and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Escutcheons for Plumbing Piping."
- O. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.
- B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.
- E. Install fresh batteries in sensor-operated mechanisms.

3.4 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224000

SECTION 230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Dielectric fittings.
 - 3. Mechanical sleeve seals.
 - 4. Sleeves.
 - 5. Escutcheons.
 - 6. Grout.
 - 7. Equipment installation requirements common to equipment sections.
 - 8. Supports and anchorages.

1.2 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 SUBMITTALS

- A. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with those requirements.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

- A. Refer to individual Division 23 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12.
- G. Solvent Cements for Joining Plastic Piping:

1. CPVC Piping: ASTM F 493.
2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.3 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
- E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
- F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.4 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
- B. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
- C. Pressure Plates: Carbon steel. Include two for each sealing element.
- D. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - 1. Underdeck Clamp: Clamping ring with set screws.
- E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe: ASTM D 1785, Schedule 40.
- G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.6 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: Polished chrome-plated.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 - 1. Finish: Polished chrome-plated.

2.7 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
 - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.
 - 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors.
- M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
- N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 - 2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.
 - 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
 - P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.
 - Q. Verify final equipment locations for roughing-in.
 - R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- 3.2 PIPING JOINT CONSTRUCTION
- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
 - B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
 - C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 - D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
 - E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
 - F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
 - G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
 - H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
 - 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - 3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
 - 4. PVC Nonpressure Piping: Join according to ASTM D 2855.
- J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.
- L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
 - 1. Plain-End Pipe and Fittings: Use butt fusion.
 - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.
- M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.3 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

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- C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.
- B. Field Welding: Comply with AWS D1.1.

3.6 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC materials and equipment.
- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.7 GROUTING

- A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 230500

SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.
- B. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Energy efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.
- D. Multispeed Motors: Variable torque.
 - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
 - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Rotor: Random-wound, squirrel cage.
- F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- G. Temperature Rise: Match insulation rating.
- H. Insulation: Class F.
- I. Code Letter Designation:
 - 1. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
- J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - 2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - 4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.
 - 3. Capacitor start, inductor run.
 - 4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal pipe hangers and supports.
 - 2. Metal framing systems.
 - 3. Thermal-hanger shield inserts.
 - 4. Fastener systems.
 - 5. Equipment supports.
- B. Related Sections:
 - 1. Division 23 Section(s) "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:
 - 1. Trapeze pipe hangers.
 - 2. Metal framing systems.
 - 3. Fiberglass strut systems.

4. Pipe stands.
5. Equipment supports.

C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of trapeze hangers.
2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

- B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

- C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.2 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.
 - c. Flex-Strut Inc.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut Corporation; Tyco International, Ltd.
 - g. Wesanco, Inc.
2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturred lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Hot-dipped galvanized.
8. Paint Coating: Epoxy.

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International; a subsidiary of Mueller Water Products Inc.
 - b. Empire Industries, Inc.
 - c. ERICO International Corporation.
 - d. Haydon Corporation; H-Strut Division.
 - e. NIBCO INC.
 - f. PHD Manufacturing, Inc.
 - g. PHS Industries, Inc.
2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4.
4. Channels: Continuous slotted steel channel with inturred lips.

5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Coating: Paint.

2.3 THERMAL-HANGER SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Carpenter & Paterson, Inc.
 2. Clement Support Services.
 3. ERICO International Corporation.
 4. National Pipe Hanger Corporation.
 5. PHS Industries, Inc.
 6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
 7. Piping Technology & Products, Inc.
 8. Rilco Manufacturing Co., Inc.
 9. Value Engineered Products, Inc.
- B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.
- C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig or ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.
- D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.4 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.6 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use

- operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- M. Insulated Piping:
1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

- a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and metal framing systems and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- G. Use padded hangers for piping that is subject to scratching.
- H. Use thermal-hanger shield inserts for insulated piping and tubing.
- I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.

4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
 5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
 6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
 11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
 12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
 17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
 18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
 19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
 20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
 21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- J. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- K. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- L. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- M. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- N. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
 8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- O. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- P. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

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- Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

END OF SECTION 230529

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.
 - 4. Duct labels.
 - 5. Valve tags.
 - 6. Warning tags.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Stainless steel, 0.025-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: White.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches high.

2.4 DUCT LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: White.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

- I. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.
 1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
 2. Lettering Size: At least 1-1/2 inches high.

2.5 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
 1. Tag Material: Stainless steel, 0.025-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 2. Fasteners: Brass wire-link or beaded chain; or S-hook.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
 1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
 1. Size: Approximately 4 by 7 inches.
 2. Fasteners: Brass grommet and wire.
 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
 4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 20 feet along each run. Reduce intervals to 10 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- B. Pipe Label Color Schedule:
 - 1. Refrigerant Piping:
 - a. Background Color: Black.
 - b. Letter Color: White.
 - 2. Condensate Piping:
 - a. Background Color: Black.
 - b. Letter Color: White.

3.4 DUCT LABEL INSTALLATION

- A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:
 - 1. Blue: For cold-air supply ducts.
 - 2. Yellow: For hot-air supply ducts.
 - 3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
- B. Stenciled Duct Label Option: Stenciled labels, showing service and flow direction, may be provided instead of plastic-laminated duct labels, at Installer's option, if lettering larger than 1

inch high is needed for proper identification because of distance from normal location of required identification.

- C. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 20 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
 - 1. Valve-Tag Size and Shape:
 - a. Refrigerant: 1-1/2 inches, round.
 - 2. Valve-Tag Color:
 - a. Refrigerant: Natural.
 - 3. Letter Color:
 - a. Refrigerant: Black.

3.6 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Balancing Air Systems:
 - a. Constant-volume air systems.

1.2 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An entity engaged to perform TAB Work.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.2.
- C. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- D. Certified TAB reports.
- E. Sample report forms.
- F. Instrument calibration reports, to include the following:
 - 1. Instrument type and make.
 - 2. Serial number.

3. Application.
4. Dates of use.
5. Dates of calibration.

1.4 QUALITY ASSURANCE

- A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC or NEBB.
 1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC or NEBB.
 2. TAB Technician: Employee of the TAB contractor and who is certified by AABC or NEBB as a TAB technician.
- B. TAB Conference: Meet with Architect, Engineer or Owner for approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide seven days' advance notice of scheduled meeting time and location.
 1. Agenda Items:
 - a. The Contract Documents examination report.
 - b. The TAB plan.
 - c. Coordination and cooperation of trades and subcontractors.
 - d. Coordination of documentation and communication flow.
- C. Certify TAB field data reports and perform the following:
 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
- D. TAB Report Forms: Use standard TAB contractor's forms approved by Architect, Engineer or Owner.

1.5 PROJECT CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.
- B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.6 COORDINATION

- A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.
- B. Perform TAB after leakage and pressure tests on air distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Division 23 Section "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.
- K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.
- L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.
- M. Examine operating safety interlocks and controls on HVAC equipment.
- N. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system-readiness checks and prepare reports. Verify the following:
 - 1. Permanent electrical-power wiring is complete.
 - 2. Automatic temperature-control systems are operational.
 - 3. Equipment and duct access doors are securely closed.
 - 4. Balance, smoke, and fire dampers are open.
 - 5. Isolating and balancing valves are open and control valves are operational.
 - 6. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 - 7. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - 2. After testing and balancing, install test ports and duct access doors that comply with requirements in Division 23 Section "Air Duct Accessories."
 - 3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish.
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check dampers for proper position to achieve desired airflow path.
- H. Check for airflow blockages.
- I. Check condensate drains for proper connections and functioning.
- J. Check for proper sealing of air-handling-unit components.
- K. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
1. Measure total airflow.
 - a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.
 2. Measure fan static pressures as follows to determine actual static pressure:
 - a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.
 - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
 - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
 3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
 - a. Report the cleanliness status of filters and the time static pressures are measured.
 4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
 5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
1. Measure airflow of submain and branch ducts.
 - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
 3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- C. Measure air outlets and inlets without making adjustments.
1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.
1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.6 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
1. Manufacturer's name, model number, and serial number.
 2. Motor horsepower rating.
 3. Motor rpm.
 4. Efficiency rating.
 5. Nameplate and measured voltage, each phase.
 6. Nameplate and measured amperage, each phase.
 7. Starter thermal-protection-element rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.7 TOLERANCES

- A. Set HVAC system's air flow rates within the following tolerances:
1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
 2. Air Outlets and Inlets: Plus or minus 10 percent.

3.8 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: Prepare biweekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.9 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 - 2. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 - 1. Fan curves.
 - 2. Manufacturers' test data.
 - 3. Field test reports prepared by system and equipment installers.
 - 4. Other information relative to equipment performance; do not include Shop Drawings and product data.
- C. General Report Data: In addition to form titles and entries, include the following data:
 - 1. Title page.
 - 2. Name and address of the TAB contractor.
 - 3. Project name.
 - 4. Project location.
 - 5. Architect's name and address.
 - 6. Engineer's name and address.
 - 7. Contractor's name and address.
 - 8. Report date.
 - 9. Signature of TAB supervisor who certifies the report.
 - 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 - 11. Summary of contents including the following:
 - a. Indicated versus final performance.

- b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 - D. Fan Test Reports: For supply, return, and exhaust fans, include the following:
 1. Fan Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches, and bore.
 - h. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - g. Number, make, and size of belts.
 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.
 - E. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
 1. Report Data:
 - a. System and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F.
 - d. Duct static pressure in inches wg.

- e. Duct size in inches.
- f. Duct area in sq. ft..
- g. Indicated air flow rate in cfm.
- h. Indicated velocity in fpm.
- i. Actual air flow rate in cfm.
- j. Actual average velocity in fpm.
- k. Barometric pressure in psig.

F. Air-Terminal-Device Reports:

1. Unit Data:

- a. System and air-handling unit identification.
- b. Location and zone.
- c. Apparatus used for test.
- d. Area served.
- e. Make.
- f. Number from system diagram.
- g. Type and model number.
- h. Size.
- i. Effective area in sq. ft..

2. Test Data (Indicated and Actual Values):

- a. Air flow rate in cfm.
- b. Air velocity in fpm.
- c. Preliminary air flow rate as needed in cfm.
- d. Preliminary velocity as needed in fpm.
- e. Final air flow rate in cfm.
- f. Final velocity in fpm.
- g. Space temperature in deg F.

G. Instrument Calibration Reports:

1. Report Data:

- a. Instrument type and make.
- b. Serial number.
- c. Application.
- d. Dates of use.
- e. Dates of calibration.

3.10 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Check the following for each system:
 - a. Measure airflow of at least 10 percent of air outlets.
 - b. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
 - c. Verify that balancing devices are marked with final balance position.
 - d. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect, Engineer and Owner.
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Architect, Engineer and Owner.
3. Architect, Engineer or Owner shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.11 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

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- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes insulating the following duct services:
 - 1. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
 - 2. Indoor, concealed supply
 - 3. Indoor, exposed supply
 - 4. Indoor, concealed return located in unconditioned space.
 - 5. Indoor, exposed return located in unconditioned space.

- B. Related Sections:
 - 1. Division 23 Section "Metal Ducts" for duct liners.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Field quality-control reports.

1.3 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - CertainTeed Corp.; SoftTouch Duct Wrap.
 - Johns Manville; Microlite.
 - Knauf Insulation; Friendly Feel Duct Wrap.
- G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB.
 - 1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - CertainTeed Corp.; SoftTouch Duct Wrap.
 - Johns Manville; Microlite.
 - Knauf Insulation; Friendly Feel Duct Wrap.

2.2 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.

Eagle Bridges - Marathon Industries; 225.

Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.

2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.

Eagle Bridges - Marathon Industries; 225.

Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

3. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

2.3 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

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- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.

Vimasco Corporation; 749.
 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 5. Color: White.
- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.

Eagle Bridges - Marathon Industries; 550.

Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
 2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: 60 percent by volume and 66 percent by weight.
 5. Color: White.

2.4 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.

Eagle Bridges - Marathon Industries; 405.

Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 3. Fire- and water-resistant, flexible, elastomeric sealant.
 4. Service Temperature Range: Minus 40 to plus 250 deg F.

5. Color: Aluminum.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Use sealants that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

2.5 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.6 FIELD-APPLIED JACKETS

- A. Self-Adhesive Outdoor Jacket: 60-mil- thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a cross laminated polyethylene film covered with white aluminum-foil facing.

2.7 TAPES

- A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

ABI, Ideal Tape Division; 491 AWF FSK.

Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.

Compac Corporation; 110 and 111.
 2. Width: 3 inches.
 3. Thickness: 6.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

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- B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

ABI, Ideal Tape Division; 488 AWF.

Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.

Compac Corporation; 120.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.8 SECUREMENTS

- A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with closed seal.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

ITW Insulation Systems; Gerrard Strapping and Seals.

RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

- B. Insulation Pins and Hangers:
1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- 1) AGM Industries, Inc.; Tactoo Perforated Base Insul-Hangers.
- 2) GEMCO; Perforated Base.
- 3) Midwest Fasteners, Inc.; Spindle.

Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.

Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.

Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

2. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- 1) GEMCO; Nylon Hangers.
- 2) Midwest Fasteners, Inc.; Nylon Insulation Hangers.

Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.

Spindle: Nylon, 0.106-inch- diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.

Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

3. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- 1) AGM Industries, Inc.; Tactoo Self-Adhering Insul-Hangers.
- 2) GEMCO; Peel & Press.

Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.

Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.

Adhesive-backed base with a peel-off protective cover.

4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- 1) AGM Industries, Inc.; RC-150.
- 2) GEMCO; R-150.
- 3) Midwest Fasteners, Inc.; WA-150.

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Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

5. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- 1) GEMCO.
- 2) Midwest Fasteners, Inc.

- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- D. Wire: 0.080-inch nickel-copper alloy.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

C & F Wire.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.

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- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.3 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 4. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
1. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- E. Insulation Installation at Floor Penetrations:
1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.4 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.

2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.

On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.

Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.

Do not overcompress insulation during installation.

Impale insulation over pins and attach speed washers.

Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.

Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

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3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.6 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 - 1. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
 - 2. Indoor, concealed supply and outdoor air.
 - 3. Indoor, exposed supply and outdoor air.
 - 4. Indoor, concealed return located in unconditioned space
- B. Items Not Insulated:
 - 1. Fibrous-glass ducts.
 - 2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
 - 3. Factory-insulated flexible ducts.
 - 4. Factory-insulated plenums and casings.
 - 5. Flexible connectors.
 - 6. Vibration-control devices.
 - 7. Factory-insulated access panels and doors.

3.7 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, Exhaust-Air Duct and Plenum Insulation: Mineral-fiber blanket, 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- B. Concealed, Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- C. Concealed, Return-Air Duct and Plenum Insulation: Mineral-fiber blanket 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.
- D. Exposed, Supply-Air Duct and Plenum Insulation: Mineral-fiber blanket 1-1/2 inches thick and 0.75-lb/cu. Ft nominal density.

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- E. Exposed, Return-Air Duct and Plenum Insulation: Mineral-fiber blanket 1-1/2 thick and 0.75-lb/cu. ft. nominal density.
- F. Exposed, Exhaust-Air Duct and Plenum Insulation: Mineral-fiber blanket 1-1/2 inches thick and 0.75-lb/cu. ft. nominal density.

END OF SECTION 230713

SECTION 230719 – HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulation Materials:
 - a. Cellular glass.
 - b. Flexible elastomeric.
 - c. Mineral fiber.
2. Fire-rated insulation systems.
3. Insulating cements.
4. Adhesives.
5. Mastics.
6. Sealants.
7. Factory-applied jackets.
8. Field-applied jackets.
9. Tapes.
10. Corner angles.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at pipe expansion joints for each type of insulation.
3. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
4. Detail removable insulation at piping specialties, equipment connections, and access panels.
5. Detail application of field-applied jackets.
6. Detail application at linkages of control devices.
7. Detail field application for each equipment type.

C. Field quality-control reports.

1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cell-U-Foam Corporation; Ultra-CUF.
 - b. Pittsburgh Corning Corporation; Foamglas Super K.
 2. Block Insulation: ASTM C 552, Type I.
 3. Special-Shaped Insulation: ASTM C 552, Type III.
 4. Board Insulation: ASTM C 552, Type IV.
 5. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
 6. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.

7. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- G. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Aeroflex USA Inc.; Aerocel.
 - b. Armacell LLC; AP Armaflex.
 - c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.
- H. Mineral-Fiber, Preformed Pipe Insulation:
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Fibrex Insulations Inc.; Coreplus 1200.
 - b. Johns Manville; Micro-Lok.
 - c. Knauf Insulation; 1000 Pipe Insulation.
 - d. Manson Insulation Inc.; Alley-K.
 - e. Owens Corning; Fiberglas Pipe Insulation.
 2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 3. Type II, 1200 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- I. Mineral-Fiber, Pipe Insulation Wicking System: Preformed pipe insulation complying with ASTM C 547, Type I, Grade A, with absorbent cloth factory applied to the entire inside surface of preformed pipe insulation and extended through the longitudinal joint to outside surface of insulation under insulation jacket. Factory apply a white, polymer, vapor-retarder jacket with self-sealing adhesive tape seam and evaporation holes running continuously along the longitudinal seam, exposing the absorbent cloth.
 1. Products: Subject to compliance with requirements, provide the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Knauf Insulation; Permawick Pipe Insulation.
 - b. Owens Corning; VaporWick Pipe Insulation.
- J. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x

deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; CrimpWrap.
 - b. Johns Manville; MicroFlex.
 - c. Knauf Insulation; Pipe and Tank Insulation.
 - d. Manson Insulation Inc.; AK Flex.
 - e. Owens Corning; Fiberglas Pipe and Tank Insulation.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Insulco, Division of MFS, Inc.; SmoothKote.
 - b. P. K. Insulation Mfg. Co., Inc.; PK No. 127, and Quik-Cote.
 - c. Rock Wool Manufacturing Company; Delta One Shot.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Cellular-Glass, Phenolic, Polyisocyanurate, and Polystyrene Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Products, Division of ITW; CP-96.
 - b. Foster Products Corporation, H. B. Fuller Company; 81-33.
 2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Aeroflex USA Inc.; AeroSeal.
 - b. Armacell LCC; 520 Adhesive.
 - c. Foster Products Corporation, H. B. Fuller Company; 85-75.
 - d. RBX Corporation; Rubatex Contact Adhesive.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Products, Division of ITW; CP-82.
 - b. Foster Products Corporation, H. B. Fuller Company; 85-20.
 - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
 - d. Marathon Industries, Inc.; 225.
 - e. Mon-Eco Industries, Inc.; 22-25.
 2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Products, Division of ITW; CP-82.
 - b. Foster Products Corporation, H. B. Fuller Company; 85-20.
 - c. ITW TACC, Division of Illinois Tool Works; S-90/80.
 - d. Marathon Industries, Inc.; 225.
 - e. Mon-Eco Industries, Inc.; 22-25.
 2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- F. PVC Jacket Adhesive: Compatible with PVC jacket.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Chemical Company (The); 739, Dow Silicone.
 - b. Johns-Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
 - c. P.I.C. Plastics, Inc.; Welding Adhesive.
 - d. Speedline Corporation; Speedline Vinyl Adhesive.
 2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 SEALANTS

- A. Joint Sealants:

1. Joint Sealants for Polystyrene Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Products, Division of ITW; CP-70.
 - b. Foster Products Corporation, H. B. Fuller Company; 30-45/30-46.
 - c. Marathon Industries, Inc.; 405.
 - d. Mon-Eco Industries, Inc.; 44-05.
 - e. Vimasco Corporation; 750.
 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 3. Permanently flexible, elastomeric sealant.
 4. Service Temperature Range: Minus 100 to plus 300 deg F.
 5. Color: White or gray.
 6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. FSK and Metal Jacket Flashing Sealants:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Products, Division of ITW; CP-76-8.
 - b. Foster Products Corporation, H. B. Fuller Company; 95-44.
 - c. Marathon Industries, Inc.; 405.
 - d. Mon-Eco Industries, Inc.; 44-05.
 - e. Vimasco Corporation; 750.
 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 3. Fire- and water-resistant, flexible, elastomeric sealant.
 4. Service Temperature Range: Minus 40 to plus 250 deg F.
 5. Color: Aluminum.
 6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Products, Division of ITW; CP-76.
 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 3. Fire- and water-resistant, flexible, elastomeric sealant.
 4. Service Temperature Range: Minus 40 to plus 250 deg F.
 5. Color: White.
 6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 3. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
 4. PVDC Jacket for Indoor Applications: 4-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.
 5. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.
 6. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.6 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
- C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Johns Manville; Zeston.
 - b. P.I.C. Plastics, Inc.; FG Series.
 - c. Proto PVC Corporation; LoSmoke.

- d. Speedline Corporation; SmokeSafe.
2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
- D. PVDC Jacket for Indoor Applications: 4-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Chemical Company (The), Saran 540 Vapor Retarder Film.
- E. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

2.7 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
 - b. Compac Corp.; 104 and 105.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
 - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
 2. Width: 3 inches.
 3. Thickness: 11.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
 - b. Compac Corp.; 110 and 111.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
 - d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.
 2. Width: 3 inches.
 3. Thickness: 6.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0555.
 - b. Compac Corp.; 130.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 370 White PVC tape.
 - d. Venture Tape; 1506 CW NS.
 2. Width: 2 inches.
 3. Thickness: 6 mils.
 4. Adhesion: 64 ounces force/inch in width.
 5. Elongation: 500 percent.
 6. Tensile Strength: 18 lbf/inch in width.
- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
 - b. Compac Corp.; 120.
 - c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
 - d. Venture Tape; 3520 CW.
 2. Width: 2 inches.
 3. Thickness: 3.7 mils.
 4. Adhesion: 100 ounces force/inch in width.
 5. Elongation: 5 percent.
 6. Tensile Strength: 34 lbf/inch in width.
- E. PVDC Tape for Indoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Chemical Company (The); Saran 540 Vapor Retarder Tape.
2. Width: 3 inches.
3. Film Thickness: 4 mils.
4. Adhesive Thickness: 1.5 mils.
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 lbf/inch in width.

2.8 CORNER ANGLES

- A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.
- B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105 or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct and pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Manholes.
 - 5. Handholes.
 - 6. Cleanouts.

3.3 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 - 4. Seal jacket to wall flashing with flashing sealant.

- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
- F. Insulation Installation at Floor Penetrations:
 - 1. Pipe: Install insulation continuously through floor penetrations.
 - 2. Seal penetrations through fire-rated assemblies.

3.4 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 - 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 CELLULAR-GLASS INSULATION INSTALLATION

- A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient services, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.6 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

D. Where PVDC jackets are indicated, install as follows:

1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
2. Wrap factory-presize jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presize jacket with an approximate overlap at butt joint of 2 inches over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
3. Continuous jacket can be spiral wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches or less. The 33-1/2-inch- circumference limit allows for 2-inch- overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

3.9 FINISHES

- A. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 1. Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
 2. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to four locations of straight pipe, four locations of threaded fittings, four locations of welded fittings, four locations of threaded strainers, two locations of welded strainers, four locations of threaded valves, and four locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 EQUIPMENT INSULATION SCHEDULE

- A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.
- B. Insulate indoor and outdoor equipment in paragraphs below that is not factory insulated.

3.12 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Drainage piping located in crawl spaces.
 - 2. Underground piping.
 - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.13 INDOOR/OUTDOOR PIPING INSULATION SCHEDULE

- A. Refrigerant piping, all lines: Insulation shall be:
 - a. Flexible Elastomeric: 1 inch thick.
- B. Condensate and Equipment Drain Water below 60 Deg F:
 - 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 1 inch thick.
 - b. Polyolefin: 1 inch thick.
- C. Piping, Exposed Indoor and Outdoor.
 - 1. PVC (on Fittings, pre-formed type): 40 mils thick.
 - 2. Aluminum (on Piping), Stucco Embossed with Z-Shaped Locking Seam: 0.040 inch thick.

END OF SECTION 230719

SECTION 231123 - FACILITY NATURAL-GAS PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pipes, tubes, and fittings.
 - 2. Piping specialties.
 - 3. Piping and tubing joining materials.
 - 4. Valves.
 - 5. Pressure regulators.

1.2 PERFORMANCE REQUIREMENTS

- A. Minimum Operating-Pressure Ratings:
 - 1. Piping and Valves: 100 psig minimum unless otherwise indicated.
- B. Natural-Gas System Pressure within Buildings: 0.5 psig or less.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.6 QUALITY ASSURANCE

- A. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 PIPES, TUBES, AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
 - 1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
 - 2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
 - 3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.

2.2 PIPING SPECIALTIES

- A. Appliance Flexible Connectors:
 - 1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
 - 2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
 - 3. Outdoor, Appliance Flexible Connectors: Comply with ANSI Z21.75.
 - 4. Corrugated stainless-steel tubing with polymer coating.
 - 5. Operating-Pressure Rating: 0.5 psig.
 - 6. End Fittings: Zinc-coated steel.
 - 7. Threaded Ends: Comply with ASME B1.20.1.
 - 8. Maximum Length: 72 inches
- B. Quick-Disconnect Devices: Comply with ANSI Z21.41.
 - 1. Copper-alloy convenience outlet and matching plug connector.
 - 2. Nitrile seals.
 - 3. Hand operated with automatic shutoff when disconnected.
 - 4. For indoor or outdoor applications.
 - 5. Adjustable, retractable restraining cable.
- C. Y-Pattern Strainers:
 - 1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
 - 2. End Connections: Threaded ends for NPS 2 and smaller.
 - 3. Strainer Screen: 40 mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
 - 4. CWP Rating: 125 psig.

- D. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3 JOINING MATERIALS

- A. Joint Compound and Tape: Suitable for natural gas.
- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4 MANUAL GAS SHUTOFF VALVES

- A. General Requirements for Metallic Valves, NPS 2 and Smaller: Comply with ASME B16.33.
 - 1. CWP Rating: 125 psig.
 - 2. Threaded Ends: Comply with ASME B1.20.1.
 - 3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
 - 4. Tamperproof Feature: Locking feature for valves indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 - 5. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
 - 6. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials "WOG" permanently marked on valve body.
- B. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.
 - 1. Body: Bronze, complying with ASTM B 584.
 - 2. Ball: Chrome-plated bronze.
 - 3. Stem: Bronze; blowout proof.
 - 4. Seats: Reinforced TFE; blowout proof.
 - 5. Packing: Threaded-body packnut design with adjustable-stem packing.
 - 6. Ends: Threaded, flared, or socket as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
 - 7. CWP Rating: 600 psig.
 - 8. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
 - 9. Service: Suitable for natural-gas service with "WOG" indicated on valve body.
- C. Bronze Plug Valves: MSS SP-78.
 - 1. Body: Bronze, complying with ASTM B 584.

2. Plug: Bronze.
3. Ends: Threaded, socket, as indicated in "Underground Manual Gas Shutoff Valve Schedule" and "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Operator: Square head or lug type with tamperproof feature where indicated.
5. Pressure Class: 125 psig.
6. Listing: Valves NPS 1 and smaller shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction.
7. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

2.5 DIELECTRIC UNIONS

A. Dielectric Unions:

1. Description:
 - a. Standard: ASSE 1079.
 - b. Pressure Rating: 125 psig minimum at 180 deg F.
 - c. End Connections: Solder-joint copper alloy and threaded ferrous.

2.6 LABELING AND IDENTIFYING

- ### A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored yellow.

PART 3 - EXECUTION

3.1 OUTDOOR PIPING INSTALLATION

- #### A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.
- #### B. Install underground, natural-gas piping buried at least 36 inches below finished grade. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.
1. If natural-gas piping is installed less than 36 inches below finished grade, install it in containment conduit.
- #### C. Install underground, PE, natural-gas piping according to ASTM D 2774.
- #### D. Steel Piping with Protective Coating:
1. Apply joint cover kits to pipe after joining to cover, seal, and protect joints.
 2. Repair damage to PE coating on pipe as recommended in writing by protective coating manufacturer.

3. Replace pipe having damaged PE coating with new pipe.

E. Install fittings for changes in direction and branch connections.

3.2 INDOOR PIPING INSTALLATION

A. Comply with the International Fuel Gas Code for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Verify final equipment locations for roughing-in.

L. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

M. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

- N. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.
- O. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.
- P. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.
- Q. Connect branch piping from top or side of horizontal piping.
- R. Install unions in pipes NPS 2 and smaller, adjacent to each valve, at final connection to each piece of equipment.
- S. Do not use natural-gas piping as grounding electrode.
- T. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.
- U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.3 VALVE INSTALLATION

- A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing or copper connector.

3.4 PIPING JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Threaded Joints:
 - 1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
 - 2. Cut threads full and clean using sharp dies.
 - 3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.

4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.
3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 and Smaller: Maximum span, 96 inches; minimum rod size, 3/8 inch.
2. NPS 1-1/4: Maximum span, 108 inches; minimum rod size, 3/8 inch.
3. NPS 1-1/2 and NPS 2: Maximum span, 108 inches; minimum rod size, 3/8 inch.

C. Install hangers for horizontal, corrugated stainless-steel tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8: Maximum span, 48 inches; minimum rod size, 3/8 inch.
2. NPS 1/2: Maximum span, 72 inches; minimum rod size, 3/8 inch.
3. NPS 3/4 and Larger: Maximum span, 96 inches; minimum rod size, 3/8 inch.

3.6 CONNECTIONS

A. Connect to utility's gas meter according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

- D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.
- E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.7 LABELING AND IDENTIFYING

- A. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for piping and valve identification.

3.8 FIELD QUALITY CONTROL

- A. Test, inspect, and purge natural gas according to the International Fuel Gas Code and authorities having jurisdiction.
- B. Natural-gas piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.9 OUTDOOR PIPING SCHEDULE

- A. Underground natural-gas piping shall be one of the following:
 - 1. PE pipe and fittings joined by heat fusion; service-line risers with tracer wire terminated in an accessible location.
 - 2. Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.
- B. Aboveground natural-gas piping shall be one of the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
 - 2. Steel pipe with wrought-steel fittings and welded joints.
- C. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

3.10 INDOOR PIPING SCHEDULE

- A. Aboveground, distribution piping NPS 2 and smaller shall be one of the following:
 - 1. Steel pipe with malleable-iron fittings and threaded joints.
- B. Aboveground, distribution piping NPS 2-1/2" and larger shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

3.11 ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

- A. Valves for pipe sizes NPS 2 and smaller at service meter shall be one of the following:
 1. Two-piece, full-port, bronze ball valves with bronze trim.
 2. Bronze plug valve.
- B. Distribution piping valves for pipe sizes NPS 2 and smaller shall be one of the following:
 1. Two-piece, full-port, bronze ball valves with bronze trim.
 2. Bronze plug valve.
- C. Valves in branch piping for single appliance shall be one of the following:
 1. One-piece, bronze ball valve with bronze trim.
 2. Two-piece, full-port, bronze ball valves with bronze trim.
 3. Bronze plug valve.

END OF SECTION 231123

SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes refrigerant piping used for air-conditioning applications.

1.2 SUBMITTALS

- A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop based on manufacturer's test data.
- B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.
 - 1. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.
- C. Field quality-control test reports.
- D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."
- B. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.4 PRODUCT STORAGE AND HANDLING

- A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Copper Tube: ASTM B 280, Type ACR.
- B. Wrought-Copper Fittings: ASME B16.22.
- C. Wrought-Copper Unions: ASME B16.22.
- D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.
- E. Brazing Filler Metals: AWS A5.8.
- F. Flexible Connectors:
 - 1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
 - 2. End Connections: Socket ends.
 - 3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
 - 4. Pressure Rating: Factory test at minimum 500 psig.
 - 5. Maximum Operating Temperature: 250 deg F.

2.2 VALVES AND SPECIALTIES

- A. Diaphragm Packless Valves:
 - 1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
 - 2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
 - 3. Operator: Rising stem and hand wheel.
 - 4. Seat: Nylon.
 - 5. End Connections: Socket, union, or flanged.
 - 6. Working Pressure Rating: 500 psig.
 - 7. Maximum Operating Temperature: 275 deg F.
- B. Packed-Angle Valves:
 - 1. Body and Bonnet: Forged brass or cast bronze.
 - 2. Packing: Molded stem, back seating, and replaceable under pressure.
 - 3. Operator: Rising stem.
 - 4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.

5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

C. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 275 deg F.

D. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

E. Thermostatic Expansion Valves: Comply with ARI 750.

1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: 40 deg F.
6. Superheat: Adjustable.
7. Reverse-flow option (for heat-pump applications).
8. End Connections: Socket, flare, or threaded union.
9. Working Pressure Rating: 700 psig.

F. Straight-Type Strainers:

1. Body: Welded steel with corrosion-resistant coating.
2. Screen: 100-mesh stainless steel.
3. End Connections: Socket or flare.
4. Working Pressure Rating: 500 psig.
5. Maximum Operating Temperature: 275 deg F.

G. Angle-Type Strainers:

1. Body: Forged brass or cast bronze.
2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig.
6. Maximum Operating Temperature: 275 deg F.

H. Moisture/Liquid Indicators:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 240 deg F.

I. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Working Pressure Rating: 500 psig.
9. Maximum Operating Temperature: 240 deg F.

J. Permanent Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated alumina.
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: 2 psig.
8. Working Pressure Rating: 500 psig.

9. Maximum Operating Temperature: 240 deg F.

K. Liquid Accumulators: Comply with ARI 495.

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig.
4. Maximum Operating Temperature: 275 deg F.

2.3 REFRIGERANTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. DuPont Company; Fluorochemicals Div.
2. Honeywell, Inc.; Genetron Refrigerants.

B. ASHRAE 34, R-410A

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.

B. Suction Lines NPS 4 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed joints.

C. Liquid Lines:

1. NPS 1-1/2 and Smaller: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed joints.
2. NPS 1-1/2 and Smaller: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with brazed joints.
3. NPS 2 to NPS 3: Copper, Type K, annealed- or drawn-temper tubing and wrought-copper fittings with brazed joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless valves in suction of compressor.

- B. Install service valves for gage taps at strainers if they are not an integral part of strainers.
- C. Install a liquid accumulator at the compressor suction connection.
- D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.
- E. Install a full-sized, three-valve bypass around filter dryers.
- F. Install thermostatic expansion valves as close as possible to distributors on evaporators.
 - 1. Install valve so diaphragm case is warmer than bulb.
 - 2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
 - 3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.
- G. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.
- H. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:
 - 1. Thermostatic expansion valves.
 - 2. Compressor.
- I. Install filter dryers in liquid line between compressor and thermostatic expansion valve.
- J. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping adjacent to machines to allow service and maintenance.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Select system components with pressure rating equal to or greater than system operating pressure.
- J. Refer to Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls" for solenoid valve controllers, control wiring, and sequence of operation.
- K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.
- M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.
- N. Slope refrigerant piping as follows:
 - 1. Install horizontal suction lines with a uniform slope downward to compressor.
 - 2. Install traps and double risers to entrain oil in vertical runs.
 - 3. Liquid lines may be installed level.
- O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.
- P. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.
- Q. Identify refrigerant piping and valves according to Division 23 Section "Identification for HVAC Piping and Equipment."

- R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."
- S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."
- T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 23 Section "Escutcheons for HVAC Piping."

3.4 PIPE JOINT CONSTRUCTION

- A. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 - 1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
 - 2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

3.5 HANGERS AND SUPPORTS

- A. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
 - 2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
 - 4. Spring hangers to support vertical runs.
 - 5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
 - 1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
 - 2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
 - 3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
 - 4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 6. NPS 2: Maximum span, 96 inches; minimum rod size, 3/8 inch.
 - 7. NPS 2-1/2: Maximum span, 108 inches; minimum rod size, 3/8 inch.
 - 8. NPS 3: Maximum span, 10 feet; minimum rod size, 3/8 inch.

- D. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 - 1. Comply with ASME B31.5, Chapter VI.
 - 2. Test refrigerant piping and specialties. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
 - 3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
 - a. Fill system with nitrogen to the required test pressure.
 - b. System shall maintain test pressure at the manifold gage throughout duration of test.
 - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
 - d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

- A. Charge system using the following procedures:
 - 1. Install core in filter dryers after leak test but before evacuation.
 - 2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
 - 3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
 - 4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

- A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.
- B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.
- C. Adjust set-point temperature of air-conditioning to the system design temperature.
- D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

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1. Open shutoff valves in condenser water circuit.
 2. Verify that compressor oil level is correct.
 3. Open compressor suction and discharge valves.
 4. Open refrigerant valves except bypass valves that are used for other purposes.
 5. Check open compressor-motor alignment and verify lubrication for motors and bearings.
- E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rectangular ducts and fittings.
2. Round ducts and fittings.
3. Sheet metal materials.
4. Duct Liner.
5. Sealants and gaskets.
6. Hangers and supports.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7.
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
 1. Chambers."
- B. Shop Drawings:

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1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 2. Factory- and shop-fabricated ducts and fittings.
 3. Duct layout indicating sizes, configuration, and static-pressure classes.
 4. Elevation of top of ducts.
 5. Dimensions of main duct runs from building grid lines.
 6. Fittings.
 7. Reinforcement and spacing.
 8. Seam and joint construction.
 9. Penetrations through fire-rated and other partitions.
 10. Equipment installation based on equipment being used on Project.
 11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
 12. Hangers and supports, including methods for duct and building attachment and vibration isolation.
- C. Delegated-Design Submittal:
1. Sheet metal thicknesses.
 2. Joint and seam construction and sealing.
 3. Reinforcement details and spacing.
 4. Materials, fabrication, assembly, and spacing of hangers and supports.
- D. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
 2. Suspended ceiling components.
 3. Structural members to which duct will be attached.
 4. Size and location of initial access modules for acoustical tile.
 5. Penetrations of smoke barriers and fire-rated construction.
 6. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Perimeter moldings.
- E. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
 - 3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."
- D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Lindab Inc.
 - b. McGill AirFlow LLC.
 - c. SEMCO Incorporated.
- B. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
1. Galvanized Coating Designation: G60.
 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.
- D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.
- E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

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1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

- G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. CertainTeed Corporation; Insulation Group.
- b. Johns Manville.
- c. Knauf Insulation.
- d. Owens Corning.

- B. Maximum Thermal Conductivity:

- 1) Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
- 2) Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

2. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.

3. Solvent-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

- a. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- b. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- C. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.

2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
- D. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."
1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
 2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
 3. Butt transverse joints without gaps, and coat joint with adhesive.
 4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
 5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
 6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
 7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
 8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
 - a. Fan discharges.
 - b. Intervals of lined duct preceding unlined duct.
 - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
 9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
 - a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.
 10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.5 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
 2. Tape Width: 3 inches.
 3. Sealant: Modified styrene acrylic.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 7. Service: Indoor and outdoor.
 8. Service Temperature: Minus 40 to plus 200 deg F.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
 10. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 11. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Water-Based Joint and Seam Sealant:
1. Application Method: Brush on.
 2. Solids Content: Minimum 65 percent.
 3. Shore A Hardness: Minimum 20.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. VOC: Maximum 75 g/L (less water).
 7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 8. Service: Indoor or outdoor.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- D. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
 2. Type: S.
 3. Grade: NS.
 4. Class: 25.
 5. Use: O.

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6. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- F. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
 2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.6 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.3 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 - 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 DUCT CLEANING

- A. Clean new and existing duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
 - 1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
 - 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 - 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:
 - 1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
 - 2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- D. Clean the following components by removing surface contaminants and deposits:
 - 1. Air outlets and inlets (registers, grilles, and diffusers).
 - 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 - 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
 - 4. Coils and related components.
 - 5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
 - 6. Supply-air ducts, dampers, actuators, and turning vanes.
 - 7. Dedicated exhaust and ventilation components and makeup air systems.
- E. Mechanical Cleaning Methodology:

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1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.6 START UP

- A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.7 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel.
- B. Exhaust Ducts:
 1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
 - a. Pressure Class: Negative 1-inch wg.
 - b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.
 2. Ducts Connected to Equipment Not Listed Above:
 - a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
 - c. SMACNA Leakage Class for Rectangular: 6.
 - d. SMACNA Leakage Class for Round and Flat Oval: 3.
- C. Intermediate Reinforcement:
 1. Galvanized-Steel Ducts: Galvanized steel.

D. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm:
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 - c. Velocity 1500 fpm or Higher:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.

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- 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
- 3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
- 4) Radius-to Diameter Ratio: 1.5.

- b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
- c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

E. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm: Conical tap.
 - c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Manual volume dampers.
 - 2. Flange connectors.
 - 3. Turning vanes.
 - 4. Duct-mounted access doors.
 - 5. Flexible connectors.
 - 6. Flexible ducts.
 - 7. Duct accessory hardware.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
 - 1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
 - a. Manual volume damper installations.
- C. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: [G60] [G90].
 - 2. Exposed-Surface Finish: Mill phosphatized.
- C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.
- E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. McGill AirFlow LLC.
 - b. METALAIRE, Inc.
 - c. Nailor Industries Inc.
 - d. Pottorff; a division of PCI Industries, Inc.
 - e. Ruskin Company.
 - 2. Standard leakage rating.
 - 3. Suitable for horizontal or vertical applications.
 - 4. Frames:
 - a. Hat-shaped, galvanized-steel channels, 0.064-inch minimum thickness.

- b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:
- a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized-steel, 0.064 inch thick.
6. Blade Axles: Galvanized steel.
7. Bearings:
- a. Oil-impregnated bronze.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Tie Bars and Brackets: Galvanized steel.
- B. Standard, Aluminum, Manual Volume Dampers:
- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. McGill AirFlow LLC.
 - b. METALAIRE, Inc.
 - c. Nailor Industries Inc.
 - d. Pottorff; a division of PCI Industries, Inc.
 - e. Ruskin Company.
 - 2. Standard leakage rating.
 - 3. Suitable for horizontal or vertical applications.
 - 4. Frames: Hat-shaped, 0.10-inch- thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
 - 5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Roll-Formed Aluminum Blades: 0.10-inch- thick aluminum sheet.
 - e. Extruded-Aluminum Blades: 0.050-inch- thick extruded aluminum.
 - 6. Blade Axles: Galvanized steel.
 - 7. Bearings:

- a. Oil-impregnated bronze.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Tie Bars and Brackets: Aluminum.
- C. Jackshaft:
1. Size: 1-inch diameter.
 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
 3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.
- D. Damper Hardware:
1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
 2. Include center hole to suit damper operating-rod size.
 3. Include elevated platform for insulated duct mounting.

2.3 FLANGE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Ductmate Industries, Inc.
 2. Nexus PDQ; Division of Shilco Holdings Inc.
 3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- C. Material: Galvanized steel.
- D. Gage and Shape: Match connecting ductwork.

2.4 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Ductmate Industries, Inc.
 2. Duro Dyne Inc.
 3. METALAIRE, Inc.

- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
 - 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
- E. Vane Construction: Single wall.
- F. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.5 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Ductmate Industries, Inc.
 - 2. Flexmaster U.S.A., Inc.
 - 3. Greenheck Fan Corporation.
 - 4. McGill AirFlow LLC.
 - 5. Nailor Industries Inc.
 - 6. Pottorff; a division of PCI Industries, Inc.
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."
 - 1. Door:
 - a. Double wall, rectangular.
 - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - c. Vision panel.
 - d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
 - e. Fabricate doors airtight and suitable for duct pressure class.
 - 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

3. Number of Hinges and Locks:
 - a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
 - b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
 - c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches.
 - d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

2.6 DUCT ACCESS PANEL ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Ductmate Industries, Inc.
 2. Flame Gard, Inc.
 3. 3M.
- B. Labeled according to UL 1978 by an NRTL.
- C. Panel and Frame: Minimum thickness 0.0528-inch carbon steel.
- D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.
- E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.
- F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.7 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Ductmate Industries, Inc.
 2. Duro Dyne Inc.
 3. Ventfabrics, Inc.
 4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.

- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to 2 strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd..
 - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 deg F.
- F. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
 - 1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
 - 2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 - 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 - 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 - 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 - 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
 - 7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.8 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Flexmaster U.S.A., Inc.
 - 2. McGill AirFlow LLC.
 - 3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.
 - 1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 - 2. Maximum Air Velocity: 4000 fpm.
 - 3. Temperature Range: Minus 10 to plus 160 deg F.
 - 4. Insulation R-value: Comply with ASHRAE/IESNA 90.1.
- C. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.

1. Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.
 2. Maximum Air Velocity: 4000 fpm.
 3. Temperature Range: Minus 20 to plus 175 deg F.
 4. Insulation R-Value: Comply with ASHRAE/IESNA 90.1.
- D. Insulated, Flexible Duct: UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.
1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 2. Maximum Air Velocity: 4000 fpm.
 3. Temperature Range: Minus 20 to plus 210 deg F.
 4. Insulation R-value: Comply with ASHRAE/IESNA 90.1.
- E. Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.
1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 2. Maximum Air Velocity: 4000 fpm.
 3. Temperature Range: Minus 20 to plus 210 deg F.
 4. Insulation R-value: Comply with ASHRAE/IESNA 90.1.
- F. Insulated, Flexible Duct: UL 181, Class 0, interlocking spiral of aluminum foil; fibrous-glass insulation; polyethylene vapor-barrier film.
1. Pressure Rating: 8-inch wg positive or negative.
 2. Maximum Air Velocity: 5000 fpm.
 3. Temperature Range: Minus 20 to plus 250 deg F.
 4. Insulation R-value: Comply with ASHRAE/IESNA 90.1.
- G. Flexible Duct Connectors:
1. Clamps: Nylon strap in sizes 3 through 18 inches, to suit duct size.
 2. Non-Clamp Connectors: Liquid adhesive plus tape.
- 2.9 DUCT ACCESSORY HARDWARE
- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
 - 2. Install aluminum volume dampers in aluminum ducts.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install test holes at fan inlets and outlets and elsewhere as indicated.
- F. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1. Upstream from duct filters.
 - 2. At outdoor-air intakes and mixed-air plenums.
 - 3. At drain pans and seals.
 - 4. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
 - 5. At each change in direction and at maximum 50-foot spacing.
 - 6. Upstream from turning vanes.
 - 7. Control devices requiring inspection.
 - 8. Elsewhere as indicated.
- G. Install access doors with swing against duct static pressure.
- H. Access Door Sizes:
 - 1. One-Hand or Inspection Access: 8 by 5 inches.
 - 2. Two-Hand Access: 12 by 6 inches.
 - 3. Head and Hand Access: 18 by 10 inches.
 - 4. Head and Shoulders Access: 21 by 14 inches.

5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

- I. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- J. Install flexible connectors to connect ducts to equipment.
- K. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- L. Connect flexible ducts to metal ducts with liquid adhesive plus tape.
- M. Install duct test holes where required for testing and balancing purposes.
- N. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 1. Operate dampers to verify full range of movement.
 2. Inspect locations of access doors and verify that purpose of access door can be performed.
 3. Inspect turning vanes for proper and secure installation.

END OF SECTION 233300

SECTION 233416 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Centrifugal roof ventilators.
 2. In-line centrifugal fans.
 3. Propeller fans.

1.2 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base fan-performance ratings on sea level and shall be adjusted for higher elevations where required.
- B. Operating Limits: Classify according to AMCA 99.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:
1. Certified fan performance curves with system operating conditions indicated.
 2. Certified fan sound-power ratings.
 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 4. Material thickness and finishes, including color charts.
 5. Dampers, including housings, linkages, and operators.
 6. Roof curbs.
 7. Fan speed controllers.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 2. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
 - 1. Roof framing and support members relative to duct penetrations.
 - 2. Ceiling suspension assembly members.
 - 3. Size and location of initial access modules for acoustical tile.
 - 4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Belts: One set for each belt-driven unit.

1.7 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.
- C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

1.8 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided.

- C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Greenheck Corp.
 - 2. Carnes.
 - 3. Loren Cook Co.
- B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.
 - 1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.
 - 2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.
- C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.
- D. Belt Drives:
 - 1. Resiliently mounted to housing.
 - 2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
 - 3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
 - 4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
 - 5. Fan and motor isolated from exhaust airstream.
- E. Accessories:
 - 1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 - 2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted on fan housing, factory wired through an internal aluminum conduit.
 - 3. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
 - 4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.
 - 5. Motorized Dampers: Parallel-blade dampers mounted in curb base with electric actuator; wired to close when fan stops.

- F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.
1. Configuration: Self-flashing without a cant strip, with mounting flange.
 2. Overall Height: 12 or 18 inches.
 3. Sound Curb: Curb with sound-absorbing insulation.
 4. Pitch Mounting: Manufacture curb for roof slope.
 5. Metal Liner: Galvanized steel.
 6. Burglar Bars: 1/2-inch thick steel bars welded in place to form 6-inch squares.
 7. Mounting Pedestal: Galvanized steel with removable access panel.
 8. Vented Curb: Unlined with louvered vents in vertical sides.
- G. Capacities and Characteristics:
1. See design drawings for all performance criteria.

2.2 IN-LINE CENTRIFUGAL FANS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Greenheck Corp.
 2. Carnes.
 3. Loren Cook Co.
- B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.
- C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing with wheel, inlet cone, and motor on swing-out service door.
- D. Belt-Driven Units: Motor mounted on adjustable base, with adjustable sheaves, enclosure around belts within fan housing, and lubricating tubes from fan bearings extended to outside of fan housing.
- E. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.
- F. Accessories:
1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
 3. Companion Flanges: For inlet and outlet duct connections.
 4. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.

5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

G. Capacities and Characteristics:

1. See design drawings for all performance criteria.
2. Vibration Isolators:
 - a. Type: Elastomeric or spring hangers.
 - b. Static Deflection: 1 inch.

2.3 PROPELLER FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Greenheck Corp.
2. Carnes.
3. Loren Cook Co.

B. Housing: Galvanized-steel sheet with flanged edges and integral orifice ring with baked-enamel finish coat applied after assembly.

C. Steel Fan Wheels: Formed-steel blades riveted to heavy-gage steel spider bolted to cast-iron hub.

D. Fan Wheel: Replaceable, extruded-aluminum, airfoil blades fastened to cast-aluminum hub; factory set pitch angle of blades.

E. Fan Drive: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.

F. Fan Drive:

1. Resiliently mounted to housing.
2. Statically and dynamically balanced.
3. Selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
4. Extend grease fitting to accessible location outside of unit.
5. Service Factor Based on Fan Motor Size: 1.4.
6. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
7. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
8. Pulleys: Cast iron with split, tapered bushing; dynamically balanced at factory.
9. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.

10. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
11. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.

G. Accessories:

1. Gravity Shutters: Aluminum blades in aluminum frame; interlocked blades with nylon bearings.
2. Motor-Side Back Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.
3. Wall Sleeve: Galvanized steel to match fan and accessory size.
4. Weathershield Hood: Galvanized steel to match fan and accessory size.
5. Weathershield Front Guard: Galvanized steel with expanded metal screen.
6. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
7. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.

H. Capacities and Characteristics:

1. See design drawings for all performance criteria.
2. Vibration Isolators:
 - a. Type: Elastomeric or Spring isolators.
 - b. Static Deflection: 1 inch.

2.4 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
- B. Enclosure Type: Totally enclosed, fan cooled.

2.5 SOURCE QUALITY CONTROL

- A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
- B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of

Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install power ventilators level and plumb.
- B. Equipment Mounting:
 - 1. Install power ventilators on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations.
 - 2. Comply with requirements for vibration isolation and seismic control devices in "Vibration and Seismic Controls for HVAC."
 - 3. Comply with requirements for vibration isolation devices in "Vibration Controls for HVAC."
- C. Secure roof-mounted fans to roof curbs with cadmium-plated hardware.
- D. Ceiling Units: Suspend units from structure; use threaded steel hanger rods.
- E. Support suspended units from structure using threaded steel rods and elastomeric or spring hangers having a static deflection of 1 inch.
- F. Install units with clearances for service and maintenance.
- G. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."
- B. Install ducts adjacent to power ventilators to allow service and maintenance.
- C. Ground equipment according to "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
 - 1. Verify that shipping, blocking, and bracing are removed.
 - 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 - 3. Verify that cleaning and adjusting are complete.
 - 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
 - 5. Adjust belt tension.
 - 6. Adjust damper linkages for proper damper operation.
 - 7. Verify lubrication for bearings and other moving parts.
 - 8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
 - 9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
 - 10. Shut unit down and reconnect automatic temperature-control operators.
 - 11. Remove and replace malfunctioning units and retest as specified above.
- C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
- D. Replace fan and motor pulleys as required to achieve design airflow.
- E. Lubricate bearings.

HVAC POWER VENTILATORS

Restoration and Expansion
Historic Metlar-Bodine House
Piscataway, Middlesex County, NJ
Architects Project No.: 1836C

END OF SECTION 233416

SECTION 235416.13 - GAS-FIRED FURNACES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Gas-fired, condensing furnaces and accessories complete with controls.
 - 2. Air filters.
 - 3. Refrigeration components.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings:
 - 1. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each furnace to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Furnace and accessories complete with controls.
 - b. Air filter.
 - c. Refrigeration components.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Disposable Air Filters: Furnish two complete sets.
 - 2. Fan Belts: Furnish one set(s) for each furnace fan.

1.6 QUALITY ASSURANCE

- A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- B. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- C. Comply with NFPA 70.

1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace the following components of furnaces that fail in materials or workmanship within specified warranty period:
 - 1. Warranty Period, Commencing on Date of Substantial Completion:
 - a. Furnace Heat Exchanger: 10 years.
 - b. Integrated Ignition and Blower Control Circuit Board: Five years.
 - c. Draft-Inducer Motor: Five years.
 - d. Refrigeration Compressors: 10 years.
 - e. Evaporator and Condenser Coils: Five years.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a qualified testing agency, and marked for intended location and application.
- B. General Requirements for Noncondensing Gas-Fired Furnaces: Factory assembled, piped, wired, and tested; complying with ANSI Z21.47/CSA 2.3 and NFPA 54.

2.2 GAS-FIRED FURNACES, CONDENSING

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carrier Corporation.
2. Lennox Industries, Inc.
3. Trane Co.

B. Cabinet: Steel.

1. Cabinet interior around heat exchanger shall be factory-installed insulation.
2. Lift-out panels shall expose burners and all other items requiring access for maintenance.
3. Factory paint external cabinets in manufacturer's standard color.
4. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

C. Fan: Centrifugal, factory balanced, resilient mounted, direct drive.

1. Special Motor Features: Electronically controlled motor (ECM) controlled by integrated furnace/blower control.

D. Type of Gas: Natural

E. Heat Exchanger:

1. Primary: Aluminized steel.

F. Burner:

1. Gas Valve: 100 percent safety two-stage main gas valve, main shutoff valve, pressure regulator, safety pilot with electronic flame sensor, limit control, transformer, and combination ignition/fan timer control board.
2. Ignition: Electric pilot ignition, with hot-surface igniter or electric spark ignition.

G. Gas-Burner Safety Controls:

1. Electronic Flame Sensor: Prevents gas valve from opening until pilot flame is proven; stops gas flow on ignition failure.
2. Flame Rollout Switch: Installed on burner box; prevents burner operation.
3. Limit Control: Fixed stop at maximum permissible setting; de-energizes burner on excessive bonnet temperature; automatic reset.

H. Combustion-Air Inducer: Centrifugal fan with thermally protected motor and sleeve bearings prepurges heat exchanger and vents combustion products; pressure switch prevents furnace operation if combustion-air inlet or flue outlet is blocked.

GAS-FIRED FURNACES

Restoration and Expansion
Historic Metlar-Bodine House
Piscataway, Middlesex County, NJ
Architects Project No.: 1836C

- I. Furnace Controls: Solid-state board integrates ignition, heat, cooling, and fan speeds; adjustable fan-on and fan-off timing; terminals for connection to accessories; diagnostic light with viewport.
- J. Accessories:
 - 1. Combination Combustion-Air Intake and Vent: PVC plastic fitting to combine combustion-air inlet and vent through roof.
 - 2. CPVC Plastic Vent Materials:
 - a. Materials and size as per manufacturers requirements.
- K. Capacities and Characteristics:
 - 1. As noted on Mechanical Schedules

2.3 THERMOSTATS

- A. Controls shall comply with requirements in ASHRAE/IES 90.1, "Controls."
- B. Solid-State Thermostat: Wall-mounted, programmable, microprocessor-based unit with automatic switching from heating to cooling, preferential rate control, seven-day programmability with minimum of four temperature presets per day, vacation mode, and battery backup protection against power failure for program settings.
- C. Control Wiring: Unshielded twisted-pair cabling.
 - 1. No. 24 AWG, 100 ohm, four pair.
 - 2. Cable Jacket Color: Blue.

2.4 AIR FILTERS

- A. Disposable Filters: 1-inch- thick fiberglass media with ASHRAE 52.2 MERV rating of 6 or higher, in sheet metal frame.

2.5 REFRIGERATION COMPONENTS

- A. General Refrigeration Component Requirements:
 - 1. Refrigeration compressor, coils, and specialties shall be designed to operate with CFC-free refrigerants.
 - 2. Energy Efficiency: Equal to or greater than prescribed by ASHRAE/IES 90.1.

- B. Refrigerant Coil: Copper tubes mechanically expanded into aluminum fins. Comply with AHRI 210/240. Match size with furnace. Include condensate drain pan with accessible drain outlet complying with ASHRAE 62.1.
1. Refrigerant Coil Enclosure: Steel, matching furnace and evaporator coil, with access panel and flanges for integral mounting at or on furnace cabinet and galvanized sheet metal drain pan coated with black asphaltic base paint.
- C. Refrigerant Line Kits: Annealed-copper suction and liquid lines factory cleaned, dried, pressurized with nitrogen, sealed, and with suction line insulated. Provide in standard lengths for installation without joints, except at equipment connections.
1. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534/C 534M, Type I, 1 inch thick.
- D. Refrigerant Piping: Comply with requirements in Section 232300 "Refrigerant Piping."
- E. Air-Cooled Compressor-Condenser Unit:
1. Casing: Steel, finished with baked enamel, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
 2. Compressor: Hermetically sealed scroll type.
 - a. Crankcase heater.
 - b. Vibration isolation mounts for compressor.
 - c. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
 - d. Two-speed compressor motors shall have manual-reset high-pressure switch and automatic-reset low-pressure switch.
 - e. Refrigerant Charge: R-410A.
 - f. Refrigerant: R-407C or R-410A.
 3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with AHRI 210/240, and with liquid subcooler.
 4. Fan: Aluminum-propeller type, directly connected to motor.
 5. Motor: Permanently lubricated, with integral thermal-overload protection.
- F. Capacities and Characteristics:
1. As noted on Mechanical Schedules.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine factory-installed insulation before furnace installation. Reject units that are wet, moisture damaged, or mold damaged.
- C. Examine roughing-in for gas and refrigerant piping systems to verify actual locations of piping connections before equipment installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install gas-fired furnaces and associated fuel and vent features and systems according to NFPA 54.
- B. Suspended Units: Suspend from structure using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.
 - 1. Install seismic restraints to limit movement of furnace by resisting code-required seismic acceleration.
- C. Base-Mounted Units: Secure units to substrate. Provide optional bottom closure base if required by installation conditions.
 - 1. Anchor furnace to substrate to resist code-required seismic acceleration.
- D. Controls: Install thermostats and humidistats at mounting height of 60 inches above floor.
- E. Wiring Method: Install control wiring in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal control wiring except in unfinished spaces.

3.3 CONNECTIONS

- A. Gas piping installation requirements are specified in Section 231126 "Facility Liquefied-Petroleum Gas Piping." Drawings indicate general arrangement of piping, fittings, and specialties. Connect gas piping with union or flange and appliance connector valve.
- B. Install piping adjacent to equipment to allow service and maintenance.

- C. Vent Connection, Noncondensing, Gas-Fired Furnaces: Connect Type B vents to furnace vent connection and extend outdoors. Type B vents and their installation requirements are specified in Section 235100 "Breechings, Chimneys, and Stacks."
- D. Vent and Outside-Air Connection, Condensing, Gas-Fired Furnaces: Connect plastic piping vent material to furnace connections and extend outdoors. Terminate vent outdoors with a cap and in an arrangement that will protect against entry of birds, insects, and dirt.
 - 1. Materials and size as per manufacturers requirements.
 - 2. Slope pipe vent back to furnace or to outside terminal.
- E. Connect ducts to furnace with flexible connector. Comply with requirements in Section 233300 "Air Duct Accessories."
- F. Connect refrigerant tubing kits to refrigerant coil in furnace and to air-cooled compressor-condenser unit.
 - 1. Flared Joints: Use ASME B16.26 fitting and flared ends, following procedures in CDA's "Copper Tube Handbook."
 - 2. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
 - 3. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.
- G. Comply with requirements in Section 232300 "Refrigerant Piping" for installation and joint construction of refrigerant piping.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Perform electrical test and visual and mechanical inspection.
 - 2. Leak Test: After installation, charge systems with refrigerant and test for leaks. Repair leaks, replace lost refrigerant, and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
 - 4. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
 - 5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.

3.5 STARTUP SERVICE

- A. Complete installation and startup checks according to manufacturer's written instructions and perform the following:
 - 1. Inspect for physical damage to unit casings.
 - 2. Verify that access doors move freely and are weathertight.
 - 3. Clean units and inspect for construction debris.
 - 4. Verify that all bolts and screws are tight.
 - 5. Adjust vibration isolation and flexible connections.
 - 6. Verify that controls are connected and operational.
- B. Adjust fan belts to proper alignment and tension.
- C. Start unit according to manufacturer's written instructions and complete manufacturer's operational checklist.
- D. Measure and record airflows.
- E. Verify proper operation of capacity control device.
- F. After startup and performance test, lubricate bearings.

3.6 ADJUSTING

- A. Adjust initial temperature and humidity set points.
- B. Set controls, burner, and other adjustments for optimum heating performance and efficiency. Adjust heat-distribution features, including shutters, dampers, and relays, to provide optimum heating performance and system efficiency.

3.7 CLEANING

- A. After completing installation, clean furnaces internally according to manufacturer's written instructions.
- B. Install new filters in each furnace within 14 days after Substantial Completion.

3.8 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain condensing units. Refer to Section 017900 "Demonstration and Training."

END OF SECTION 235416.13

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:

1. Section 260513 "Medium-Voltage Cables" for single-conductor and multiconductor cables, cable splices, and terminations for electrical distribution systems with 2001 to 35,000 V.
2. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2 and 3 control cables.
3. Section 271500 "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.
- B. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2.
- C. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable,

2.2 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 12 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-2-THWN-2, single conductors in raceway.
- B. Exposed Feeders: Type THHN-2-THWN-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-2-THWN-2, single conductors in raceway.
- D. Coordinate "Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground" Paragraph below with Section 260543 "Underground Ducts and Raceways for Electrical Systems."
- E. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.
- F. Feeders Installed below Raised Flooring: Type THHN-2-THWN-2, single conductors in raceway.
- G. Exposed Branch Circuits, Including in Crawlspace: Type THHN-2-THWN-2, single conductors in raceway.

- H. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Metal-clad cable, Type MC Nonmetallic-sheathed cable.
- I. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.
- J. Branch Circuits Installed below Raised Flooring: Type THHN-2-THWN-2, single conductors in raceway or Metal-clad cable, Type MC.
- K. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner. Correct deficiencies determined during the scan.
 - a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
 - b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

- c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- B. Test and Inspection Reports: Prepare a written report to record the following:
1. Procedures used.
 2. Results that comply with requirements.
 3. Results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- C. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 260519

SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. UTP cabling.
2. RS-485 cabling.
3. Low-voltage control cabling.
4. Control-circuit conductors.
5. Identification products.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

- A. Source quality-control reports.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PERFORMANCE REQUIREMENTS

- A. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262 by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.
 - 1. Flame Travel Distance: 60 inches or less.
 - 2. Peak Optical Smoke Density: 0.5 or less.
 - 3. Average Optical Smoke Density: 0.15 or less.
- B. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.
- C. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

2.3 BACKBOARDS

- A. Description: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels in Section 061000 "Rough Carpentry."
- B. Painting: Paint plywood on all sides and edges with [flat] [eggshell] [black] <Insert color> [latex] [alkyd] paint. Comply with requirements in Section 099123 "Interior Painting."

2.4 UTP CABLE

- A. Description: 100-ohm, four-pair UTP, 24-pair UTP, formed into four-pair binder groups with no overall jacket.
 - 1. Comply with ICEA S-90-661 for mechanical properties of Category 5e cables.
 - 2. Comply with ICEA S-102-700 for mechanical properties of Category 6 cables.
 - 3. Comply with TIA-568-C.1 for performance specifications.
 - 4. Comply with TIA-568-C.2, Category 6A.
 - 5. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with NEMA WC 66, UL 444 and NFPA 70 for the following types:

- a. Communications, Plenum Rated: Type CMP complying with UL 1685. Type CM or Type CMX in metallic conduit installed per NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
- b. Communications, Riser Rated: Type CMP, or Type CMR in listed plenum or riser communications raceway. Type CMP or Type CMR in metallic conduit installed per NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
- c. Communications, General Purpose: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed per NFPA 70.

2.5 UTP CABLE HARDWARE

- A. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-C.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
- B. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.
- C. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
- D. Jacks and Jack Assemblies: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-C.1.
- E. Patch Cords: Factory-made, four-pair cables in 48-inch lengths; terminated with eight-position modular plug at each end.
 1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
 2. Patch cords shall have color-coded boots for circuit identification.
- F. Workstation Outlets: Two-port-connector assemblies mounted in single faceplate.
- G. Faceplates:
 1. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."

2. Metal Faceplate: Stainless steel or as specified by the architect complying with requirements in Section 262726 "Wiring Devices."
3. For use with snap-in jacks accommodating any combination of UTP, optical-fiber, and coaxial work area cords.
 - a. Flush-mounted jacks, positioning the cord at a 45-degree angle.

H. Legend:

1. Factory labeled by silk-screening or engraving.
2. Machine printed, in the field, using adhesive-tape label.
3. Snap-in, clear-label covers and machine-printed paper inserts.

2.6 RS-485 CABLE

A. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, one pair, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262.

2.7 LOW-VOLTAGE CONTROL CABLE

A. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. One pair, twisted, tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

2.8 CONTROL-CIRCUIT CONDUCTORS

- A. Class 1 Control Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 44 UL 83.
- B. Class 2 Control Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 44 UL 83.
- C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway, complying with UL 44 UL 83.
- D. Class 2 Control Circuits and Class 3 Remote-Control and Signal Circuits That Supply Critical Circuits: Circuit Integrity (CI) cable.
 - 1. Smoke control signaling and control circuits.

2.9 SOURCE QUALITY CONTROL

- A. Factory test UTP cables according to TIA-568-C.2.
- B. Factory test optical-fiber cables according to TIA-568-C.3.
- C. Cable will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Test cables on receipt at Project site.
 - 1. Test each pair of UTP cable for open and short circuits.

3.2 INSTALLATION OF RACEWAYS AND BOXES

- A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.
 - 1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

2. Flexible metal conduit shall not be used.
- B. Comply with TIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.
- C. Install manufactured conduit sweeps and long-radius elbows if possible.
- D. Raceway Installation in Equipment Rooms:
1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed, or in the corner of the room if multiple sheets of plywood are installed around perimeter walls of the room.
 2. Install cable trays to route cables if conduits cannot be located in these positions.
 3. Secure conduits to backboard if entering the room from overhead.
 4. Extend conduits 3 inches above finished floor.
 5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.
- E. Backboards: Install backboards with 96-inch dimension horizontally. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1 and NFPA 70.
- B. General Requirements for Cabling:
1. Comply with TIA-568-C Series of standards.
 2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems".
 3. Terminate all conductors and optical fibers; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and patch panels.
 4. Cables may not be spliced.
 5. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5,

"Copper Structured Cabling Systems" and Ch. 6, "Optical Fiber Structured Cabling Systems." Install lacing bars and distribution spools.

7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
 9. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems" and Ch. 6, "Optical Fiber Structured Cabling Systems." Monitor cable pull tensions.
 10. Support: Do not allow cables to lie on removable ceiling tiles.
 11. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
- C. UTP Cable Installation:
1. Comply with TIA-568-C.2.
 2. Install termination hardware as specified in Section 271500 "Communications Horizontal Cabling" unless otherwise indicated.
 3. Do not untwist UTP cables more than 1/2 inch at the point of termination to maintain cable geometry.
- D. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
 2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 30 inches apart.
 3. Cable shall not be run through or on structural members or in contact with pipes, ducts, or other potentially damaging items. Do not run cables between structural members and corrugated panels.
- E. Separation from EMI Sources:
1. Comply with BICSI TDMM and TIA-569-B recommendations for separating unshielded copper voice and data communications cable from potential EMI sources including electrical power lines and equipment.

3.4 REMOVAL OF CONDUCTORS AND CABLES

- A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified for future use with a tag.

3.5 CONTROL-CIRCUIT CONDUCTORS

- A. Minimum Conductor Sizes:
 - 1. Class 1 remote-control and signal circuits; No 14 AWG.
 - 2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
 - 3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

3.6 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-B, Annex A, "Firestopping."
- C. Comply with BICSI TDMM, "Firestopping" Chapter.

3.7 GROUNDING

- A. For data communication wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.
- B. For low-voltage control wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.8 IDENTIFICATION

- A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Identify data and communications system components, wiring, and cabling according to TIA-606-A; label printers shall use label stocks, laminating adhesives, and inks complying with UL 969.

3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Visually inspect UTP and optical-fiber cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test UTP cabling for direct-current loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not after cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

END OF SECTION 260523

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. **Burndy; Part of Hubbell Electrical Systems.**
 - 2. **ERICO International Corporation.**
 - 3. **ILSCO.**
 - 4. **O-Z/Gedney; an EGS Electrical Group brand; an Emerson Industrial Automation business.**
 - 5. **Siemens Power Transmission & Distribution, Inc.**

2.2 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless exothermic-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.5 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install barecopper conductor, No. 2/0 AWG minimum.
 - 1. Bury at least 24 inches below grade.
- C. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.3 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, nonshrink grout. Contractor shall coordinate with the local utility for final requirements.
- C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded,

hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields according to written instructions by manufacturer of splicing and termination kits. Contractor shall coordinate with the local utility for final requirements.

- D. Pad-Mounted Transformers and Switches: Install two ground rods around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for taps to equipment grounding terminals.

3.4 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.
 - 4. Single-phase motor and appliance branch circuits.
 - 5. Three-phase motor and appliance branch circuits.
 - 6. Flexible raceway runs.
 - 7. Armored and metal-clad cable runs.
 - 8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
 - 9. X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

- D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- E. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.
- F. Metallic Fences: Comply with requirements of IEEE C2.
 - 1. Grounding Conductor: Bare copper, not less than No. 8 AWG.
 - 2. Gates: Shall be bonded to the grounding conductor with a flexible bonding jumper.
 - 3. Barbed Wire: Strands shall be bonded to the grounding conductor.

3.5 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches deep, with cover.

1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- F. Grounding and Bonding for Piping:
1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.3 ACTION SUBMITTALS

- A. Product Data: For steel slotted support systems.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.
 - 2. Steel slotted channel systems. Include Product Data for components.
 - 3. Equipment supports.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. **Allied Tube & Conduit.**
 - b. **Cooper B-Line, Inc.; a division of Cooper Industries.**
 - c. **ERICO International Corporation.**
 - d. **Thomas & Betts Corporation; a member of the ABB Group.**
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 5. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
2. Mechanical-Expansion Anchors: Insert-wedge-type, [zinc-coated] [stainless] steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 - 6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 Spring-tension clamps.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete." Or Section 033053 "Miscellaneous Cast-in-Place Concrete."
- C. Anchor equipment to concrete base.
 - 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Touchup: Comply with requirements in Section 099113 "Exterior Painting" Section 099123 "Interior Painting" and Section 099600 "High Performance Coatings" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.
7. Handholes and boxes for exterior underground cabling.

B. Related Requirements:

1. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.
2. Section 270528 "Pathways for Communications Systems" for conduits, wireways, surface pathways, innerduct, boxes, faceplate adapters, enclosures, cabinets, and handholes serving communications systems.
3. Section 280528 "Pathways for Electronic Safety and Security" for conduits, surface pathways, innerduct, boxes, and faceplate adapters serving electronic safety and security.

1.2 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
 1. Structural members in paths of conduit groups with common supports.

2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. GRC: Comply with ANSI C80.1 and UL 6.
- C. IMC: Comply with ANSI C80.6 and UL 1242.
- D. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit IMC.
 1. Comply with NEMA RN 1.
 2. Coating Thickness: 0.040 inch, minimum.
- E. EMT: Comply with ANSI C80.3 and UL 797.
- F. FMC: Comply with UL 1; zinc-coated steel or aluminum.
- G. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 2. Fittings for EMT:
 - a. Material: Steel or die cast.
 - b. Type: Setscrew or compression.
 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
 4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.
- I. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ENT: Comply with NEMA TC 13 and UL 1653.
- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. LFNC: Comply with UL 1660.
- E. Continuous HDPE: Comply with UL 651B.
- F. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.
- G. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- H. Fittings for LFNC: Comply with UL 514B.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 Type 3R Type 4 Type 12 unless otherwise indicated, and sized according to NFPA 70.
 - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

- A. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.

- C. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

2.5 SURFACE RACEWAYS

- A. Listing and Labeling: Surface raceways and tele-power poles shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5.
- C. Surface Nonmetallic Raceways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.
- D. Tele-Power Poles:
 - 1. Material: Galvanized steel with ivory baked-enamel finish.
 - 2. Fittings and Accessories: Dividers, end caps, covers, cutouts, wiring harnesses, devices, mounting materials, and other fittings shall match and mate with tele-power pole as required for complete system.

2.6 BOXES, ENCLOSURES, AND CABINETS

- A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy or aluminum, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- E. Metal Floor Boxes:
 - 1. Material: Cast metal or sheet metal.
 - 2. Type: Fully adjustable.
 - 3. Shape: Rectangular.
 - 4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- F. Nonmetallic Floor Boxes: Nonadjustable, round or rectangular, as specified on the drawings.

1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- G. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
- H. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.
1. Listing and labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- I. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- J. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- K. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- L. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.
- M. Gangable boxes are allowed.
- N. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated on the drawings.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 2. Nonmetallic Enclosures: Fiberglass.
 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- O. Cabinets:
1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 2. Hinged door in front cover with flush latch and concealed hinge.
 3. Key latch to match panelboards.
 4. Metal barriers to separate wiring of different systems and voltage.
 5. Accessory feet where required for freestanding equipment.
 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Standard: Comply with SCTE 77.
2. Configuration: Designed for flush burial with integral closed bottom unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC."
6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of polymer concrete.

1. Standard: Comply with SCTE 77.
2. Configuration: Designed for flush burial with integral closed bottom unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC."
6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: IMC or RNC, Type EPC-40-PVC.

3. Underground Conduit: RNC, Type EPC-80-PVC, concrete encased.
 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFNC.
 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated.
1. Exposed, Not Subject to Physical Damage: EMT.
 2. Exposed, Not Subject to Severe Physical Damage: EMT.
 3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - d. Gymnasiums.
 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 6. Damp or Wet Locations: GRC.
 7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 3. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- F. Install surface raceways only where indicated on Drawings.
- G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- D. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- E. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- F. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- G. Support conduit within 12 inches of enclosures to which attached.
- H. Raceways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
 - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
 - 5. Change from ENT to GRC or IMC before rising above floor.
- I. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for raceways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

- K. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- N. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- O. Surface Raceways:
 - 1. Install surface raceway with a minimum 2-inch radius control at bend points.
 - 2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- P. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.
- Q. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service raceway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.
- R. Expansion-Joint Fittings:
 - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet.
 - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.

- b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.
3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per degree F of temperature change for PVC conduits.
 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- S. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- T. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to top of box unless otherwise indicated.
- U. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.
- V. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- W. Locate boxes so that cover or plate will not span different building finishes.
- X. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- Y. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- Z. Set metal floor boxes level and flush with finished floor surface.
- AA. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
5. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- D. Install handholes with bottom below frost line.
- E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.

2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. Sleeves for Rectangular Openings:
 1. Material: Galvanized sheet steel.
 2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 2. Pressure Plates: Carbon steel Stainless steel.
 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL
RACEWAYS AND CABLING

Restoration and Expansion
Historic Metlar-Bodine House
Piscataway, Middlesex County, NJ
Architects Project No.: 1836C

END OF SECTION 260544

SECTION 260572 - OVERCURRENT PROTECTIVE DEVICE SHORT-CIRCUIT STUDY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes a computer-based, fault-current study to determine the minimum interrupting capacity of circuit protective devices.

1.2 ACTION SUBMITTALS

- A. Product Data: For computer software program to be used for studies.
- B. Other Action Submittals: Submit the following after the approval of system protective devices submittals. Submittals shall be in digital form.
 - 1. Short-circuit study input data, including completed computer program input data sheets.
 - 2. Short-circuit study and equipment evaluation report; signed, dated, and sealed by a qualified professional engineer.
 - a. Submit study report for action prior to receiving final approval of the distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that the selection of devices and associated characteristics is satisfactory.
 - b. Revised single-line diagram, reflecting field investigation results and results of short-circuit study.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Short-Circuit Study Specialist.

1.4 QUALITY ASSURANCE

- A. Studies shall use computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are unacceptable.

- B. Short-Circuit Study Software Developer Qualifications: An entity that owns and markets computer software used for studies, having performed successful studies of similar magnitude on electrical distribution systems using similar devices.
 - 1. The computer program shall be developed under the charge of a licensed professional engineer who holds IEEE Computer Society's Certified Software Development Professional certification.
- C. Short-Circuit Study Specialist Qualifications: Professional engineer in charge of performing the study and documenting recommendations, licensed in the state where Project is located. All elements of the study shall be performed under the direct supervision and control of this professional engineer.
- D. Field Adjusting Agency Qualifications: An independent agency, with the experience and capability to adjust overcurrent devices and to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 COMPUTER SOFTWARE

- A. Comply with IEEE 399 and IEEE 551.
- B. Analytical features of fault-current-study computer software program shall have the capability to calculate mandatory features as listed in IEEE 399.

2.2 SHORT-CIRCUIT STUDY REPORT CONTENTS

- A. Executive summary.
- B. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of the computer printout.
- C. One-line diagram, showing the following:
 - 1. Protective device designations and ampere ratings.
 - 2. Cable size and lengths.
 - 3. Transformer kilovolt ampere (kVA) and voltage ratings.

4. Motor and generator designations and kVA ratings.
 5. Switchgear, switchboard, motor-control center, and panelboard designations.
- D. Comments and recommendations for system improvements, where needed.
- E. Protective Device Evaluation:
1. Evaluate equipment and protective devices and compare to short-circuit ratings.
 2. Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
 3. For 600-V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
 4. For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in the standards to 1/2-cycle symmetrical fault current.
- F. Short-Circuit Study Input Data: As described in "Power System Data" Article in the Evaluations.
- G. Short-Circuit Study Output:
1. Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.
 - b. Calculated fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. Equivalent impedance.
 2. Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:
 - a. Voltage.
 - b. Calculated symmetrical fault-current magnitude and angle.
 - c. Fault-point X/R ratio.
 - d. Calculated asymmetrical fault currents:
 - 1) Based on fault-point X/R ratio.
 - 2) Based on calculated symmetrical value multiplied by 1.6.
 - 3) Based on calculated symmetrical value multiplied by 2.7.
 3. Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

- a. Voltage.
- b. Calculated symmetrical fault-current magnitude and angle.
- c. Fault-point X/R ratio.
- d. No AC Decrement (NACD) ratio.
- e. Equivalent impedance.
- f. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a symmetrical basis.
- g. Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on a total basis.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Obtain all data necessary for the conduct of the study.
 1. Verify completeness of data supplied on the one-line diagram. Call any discrepancies to the attention of Architect.
 2. For equipment provided that is Work of this Project, use characteristics submitted under the provisions of action submittals and information submittals for this Project.
- B. Gather and tabulate the following input data to support the short-circuit study:
 1. Product Data for Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
 2. Obtain electrical power utility impedance at the service.
 3. Power sources and ties.
 4. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
 5. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
 6. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip, SCCR, current rating, and breaker settings.
 7. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.

8. Motor horsepower and NEMA MG 1 code letter designation.
9. Cable sizes, lengths, number, conductor material and conduit material (magnetic or nonmagnetic).

3.2 SHORT-CIRCUIT STUDY

- A. Perform study following the general study procedures contained in IEEE 399.
- B. Calculate short-circuit currents according to IEEE 551.
- C. Base study on the device characteristics supplied by device manufacturer.
- D. Begin short-circuit current analysis at the service, extending down to the system overcurrent protective devices as follows:
 1. To normal system low-voltage load buses where fault current is 10 kA or less.
 2. Exclude equipment rated 240-V ac or less when supplied by a single transformer rated less than 125 kVA.
- E. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.
- F. The calculations shall include the ac fault-current decay from induction motors. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.
 1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.
- G. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each of the following:
 1. Electric utility's supply termination point.
 2. Incoming switchgear.
 3. Low-voltage switchgear.
 4. Motor-control centers.
 5. Control panels.

6. Automatic transfer switches.
7. Branch circuit panelboards.
8. Disconnect switches.
9. <Insert significant locations in the system>.

3.3 ADJUSTING

- A. Make minor modifications to equipment as required to accomplish compliance with short-circuit study.

3.4 DEMONSTRATION

- A. Train Owner's operating and maintenance personnel in the use of study results.

END OF SECTION 260572

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each panelboard and related equipment.
 1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
 2. Detail enclosure types and details for types other than NEMA 250, Type 1.
 3. Detail bus configuration, current, and voltage ratings.
 4. Short-circuit current rating of panelboards and overcurrent protective devices.
 5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
 6. Include wiring diagrams for power, signal, and control wiring.
 7. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Panelboard schedules for installation in panelboards.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA PB 1.
- C. Comply with NFPA 70.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."
- B. Enclosures: Flush- and surface-mounted cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - c. Kitchen or Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 - d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 - 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
 - 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 - 4. Directory Card: Inside panelboard door, mounted in transparent card holder.
- C. Incoming Mains Location: Top and bottom.
- D. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.
- E. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Main and Neutral Lugs: Mechanical type.
 - 3. Ground Lugs and Bus Configured Terminators: Mechanical type.
 - 4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 - 5. Subfeed (Double) Lugs: Compression type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- F. Service Equipment Label: NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.
- G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- H. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 PERFORMANCE REQUIREMENTS

- A. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 1.

2.3 DISTRIBUTION PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Eaton Electrical Sector; Eaton Corporation.
 - 2. Schneider Electric USA, Inc.
 - 3. Siemens Industry, Inc.
 - 4. Square D.
- B. Panelboards: NEMA PB 1, power and feeder distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
- D. Mains: Circuit breaker.
- E. Branch Overcurrent Protective Devices: For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- F. Branch Overcurrent Protective Devices: For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.
- G. Branch Overcurrent Protective Devices: Fused switches.

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- B. Mains: Circuit breaker or lugs only.
- C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- D. Contactors in Main Bus: NEMA ICS 2, Class A, mechanically held, general-purpose controller, with same short-circuit interrupting rating as panelboard.
 - 1. External Control-Power Source: 120-V branch circuit.
- E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.
- F. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A.
- B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
 - 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 - 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
 - 3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time time adjustments.
 - d. Ground-fault pickup level, time delay, and $I^2 t$ response.
 - 4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
 - 5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
 - 6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
 - 7. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
 - 8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
 - d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - e. Communication Capability: Circuit-breaker-mounted Integral communication module with functions and features compatible with power monitoring and control system specified in Section 260913 "Electrical Power Monitoring and Control."
 - f. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
 - g. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
 - h. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.
- C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

1. Fuses, and Spare-Fuse Cabinet: Comply with requirements specified in Section 262813 "Fuses."

2.6 ACCESSORY COMPONENTS AND FEATURES

- A. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Receive, inspect, handle, store and install panelboards and accessories according to NECA 407 and NEMA PB 1.1.
- B. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- C. Mount top of trim 90 inches above finished floor unless otherwise indicated.
- D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- E. Install overcurrent protective devices and controllers not already factory installed.
 1. Set field-adjustable, circuit-breaker trip ranges.
- F. Install filler plates in unused spaces.
- G. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- H. Arrange conductors in gutters into groups and bundle and wrap with wire ties.
- I. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads and incorporating Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Weather-resistant receptacles.
3. Snap switches and wall-box dimmers.
4. Solid-state fan speed controls.
5. Wall-switch and exterior occupancy sensors.
6. Communications outlets.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. **Cooper Wiring Devices, Inc.**
 - 2. **Hubbell.**
 - 3. **Leviton Manufacturing Co., Inc.**
 - 4. **Pass & Seymour/Legrand (Pass & Seymour).**
- B. **Source Limitations:** Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

- A. **Wiring Devices, Components, and Accessories:** Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. **Comply with NFPA 70.**
- C. **Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:**
 - 1. **Connectors shall comply with UL 2459 and shall be made with stranding building wire.**
 - 2. **Devices shall comply with the requirements in this Section.**

2.3 STRAIGHT-BLADE RECEPTACLES

- A. **Convenience Receptacles, 125 V, 20 A:** Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
 - 1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. **Cooper Wiring Devices, Inc.**
 - b. **Hubbell.**
 - c. **Leviton Manufacturing Co., Inc.**
 - d. **Pass & Seymour/Legrand (Pass & Seymour).**

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. **Cooper Wiring Devices, Inc.**
 - b. **Hubbell.**
 - c. **Leviton Manufacturing Co., Inc.**
 - d. **Pass & Seymour/Legrand (Pass & Seymour).**

2.5 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. **Single Pole:**
 - 1) **Cooper;**
 - 2) **Hubbell;**
 - 3) **Leviton;**
 - 4) **Pass & Seymour;**
 - b. **Two Pole:**
 - 1) **Cooper;**
 - 2) **Hubbell;**
 - 3) **Leviton;**
 - 4) **Pass & Seymour;**
 - c. **Three Way:**

- 1) Cooper;
- 2) Hubbell;
- 3) Leviton;
- 4) Pass & Seymour;

d. Four Way:

- 1) Cooper;
- 2) Hubbell;
- 3) Leviton;
- 4) Pass & Seymour;

C. Pilot-Light Switches, 20 A:

1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Cooper Wiring Devices, Inc.
 - b. Hubbell.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

D. Key-Operated Switches, 120/277 V, 20 A:

1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Cooper Wiring Devices, Inc.
 - b. Hubbell.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
2. Description: Single pole, with factory-supplied key in lieu of switch handle.

2.6 DECORATOR-STYLE DEVICES

A. Convenience Receptacles: Square face, 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, and UL 498.

1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. Cooper Wiring Devices, Inc.
 - b. Hubbell.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
- B. GFCI, Feed-Through Type, Convenience Receptacles: Square face, 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and UL 943 Class A.
- 1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Cooper Wiring Devices, Inc.
 - b. Hubbell.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
- C. Toggle Switches, Square Face, 120/277 V, 20 A: Comply with NEMA WD 1, UL 20, and FS W-S-896.
- 1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Cooper Wiring Devices, Inc.
 - b. Hubbell.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
- D. Lighted Toggle Switches, Square Face, 120 V, 20 A: Comply with NEMA WD 1 and UL 20.
- 1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Cooper Wiring Devices, Inc.
 - b. Hubbell.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour/Legrand (Pass & Seymour).
 - 2. Description: With neon-lighted handle, illuminated when switch is "off."

2.7 RESIDENTIAL DEVICES

- A. Fan Speed Controls:

1. Modular, 120-V, full-wave, solid-state units with integral, quiet on-off switches and audible frequency and EMI/RFI filters.
2. Comply with UL 1917.
3. Continuously adjustable slider, 5 A.
4. Three-speed adjustable slider, 1.5 A.

B. Telephone Outlet:

1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. **Cooper Wiring Devices, Inc.**
 - b. **Leviton Manufacturing Co., Inc.**
2. Description: Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 6a. Comply with UL 1863.

C. Combination TV and Telephone Outlet:

1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. **Cooper Wiring Devices, Inc.**
 - b. **Leviton Manufacturing Co., Inc.**
2. Description: Single RJ-45 jack for 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 6a. Comply with UL 1863.

2.8 WALL-BOX DIMMERS

- A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
- B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.
- C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.
 1. 600 W; dimmers shall require no derating when ganged with other devices.

- D. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.9 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: 0.035-inch- thick, satin-finished, Type 302 stainless steel, unless otherwise indicated on the drawings.
 - 3. Material for Unfinished Spaces: Galvanized steel.
 - 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.10 FINISHES

- A. Device Color:
 - 1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
 - 2. Wiring Devices Connected to Emergency Power System: Red.
 - 3. TVSS Devices: Blue.
- B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.

6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

- B. Tests for Convenience Receptacles:
 - 1. Line Voltage: Acceptable range is 105 to 132 V.
 - 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 - 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- C. Wiring device will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 262726

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cartridge fuses rated 600 V ac and less for use in the following:
 - a. Control circuits.
 - b. Motor-control centers.
 - c. Panelboards.
 - d. Switchboards.
 - e. Enclosed controllers.
 - f. Enclosed switches.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Cooper Bussmann; a division of Cooper Industries.
 - 2. Edison; a brand of Cooper Bussmann; a division of Cooper Industries.
 - 3. Littelfuse, Inc.
 - 4. Mersen USA.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.
 - 1. Type RK-1: 600-V, zero- to 600-A rating, 200 kAIC.
 - 2. Type RK-5: 600-V, zero- to 600-A rating, 200 kAIC.
 - 3. Type CC: 600-V, zero- to 30-A rating, 200 kAIC.
 - 4. Type CD: 600-V, 31- to 60-A rating, 200 kAIC.
 - 5. Type J: 600-V, zero- to 600-A rating, 200 kAIC.
 - 6. Type L: 600-V, 601- to 6000-A rating, 200 kAIC.
 - 7. Type T: 250-V, zero- to 1200-A 600-V, zero- to 800-A rating, 200 kAIC.

FUSES

Restoration and Expansion
Historic Metlar-Bodine House
Piscataway, Middlesex County, NJ
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- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install spare-fuse cabinet(s) in location shown on the Drawings or as indicated in the field by Architect.

3.2 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Receptacle switches.
 - 4. Shunt trip switches.
 - 5. Molded-case circuit breakers (MCCBs).
 - 6. Enclosures.

1.2 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.3 PERFORMANCE REQUIREMENTS

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
- B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.7 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. **Cooper Wiring Devices, Inc.**
 - 2. **Eaton Electrical Sector; Eaton Corporation.**
 - 3. **Siemens Industry, Inc.**
 - 4. **Square D.**
- B. Type GD, General Duty, Single Throw, 240-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with cartridge fuse interiors to accommodate indicated fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- C. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- D. Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- E. Type HD, Heavy Duty, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- F. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.

2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Suitable for number, size, and conductor material.
5. Service-Rated Switches: Labeled for use as service equipment.

2.2 NONFUSIBLE SWITCHES

- A. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 1. **Cooper Wiring Devices, Inc.**
 2. **Eaton Electrical Sector; Eaton Corporation.**
 3. **Siemens Industry, Inc.**
 4. **Square D.**
- B. Type GD, General Duty, Single Throw, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- C. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- D. Type HD, Heavy Duty, Six Pole, Single Throw, 600-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- E. Type HD, Heavy Duty, Double Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- F. Accessories:
 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 3. Lugs: Suitable for number, size, and conductor material.

2.3 RECEPTACLE SWITCHES

- A. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 1. **Eaton Electrical Sector; Eaton Corporation.**
 2. **Siemens Industry, Inc.**

3. Square D.

- B. Type HD, Heavy-Duty, Single-Throw Fusible Switch: 600-V ac; UL 98 and NEMA KS 1; horsepower rated, with clips or bolt pads to accommodate indicated fuses; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- C. Type HD, Heavy-Duty, Single-Throw Nonfusible Switch: 600-V ac; UL 98 and NEMA KS 1; horsepower rated, lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- D. Interlocking Linkage: Provided between the receptacle and switch mechanism to prevent inserting or removing plug while switch is in the on position, inserting any plug other than specified, and turning switch on if an incorrect plug is inserted or correct plug has not been fully inserted into the receptacle.
- E. Receptacle: Polarized, three-phase, four-wire receptacle (fourth wire connected to enclosure ground lug).

2.4 SHUNT TRIP SWITCHES

- A. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Cooper Bussmann; a division of Cooper Industries.
 - 2. Littelfuse, Inc.
 - 3. Mersen USA.
- B. General Requirements: Comply with ASME A17.1, UL 50, and UL 98, with 200-kA interrupting and short-circuit current rating when fitted with Class J fuses.
- C. Switches: Three-pole, horsepower rated, with integral shunt trip mechanism and Class J fuse block; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.
- D. Control Circuit: 120-V ac; obtained from integral control power transformer, with primary and secondary fuses, with a control power transformer of enough capacity to operate shunt trip, connected pilot, and indicating and control devices.
- E. Accessories:
 - 1. Oiltight key switch for key-to-test function.
 - 2. Oiltight ON pilot light.
 - 3. Isolated neutral lug.
 - 4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
 - 5. Form C alarm contacts that change state when switch is tripped.
 - 6. Three-pole, double-throw, fire-safety and alarm relay; 120-V ac coil voltage.

7. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.

2.5 MOLDED-CASE CIRCUIT BREAKERS

- A. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 1. Eaton Electrical Sector; Eaton Corporation.
 2. Siemens Industry, Inc.
 3. Square D.
- B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
- D. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
 1. Instantaneous trip.
 2. Long- and short-time pickup levels.
 3. Long- and short-time time adjustments.
 4. Ground-fault pickup level, time delay, and I^2t response.
- E. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.
- F. Features and Accessories:
 1. Standard frame sizes, trip ratings, and number of poles.
 2. Lugs: Suitable for number, size, trip ratings, and conductor material.
 3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
 4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
 5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
 6. Auxiliary Contacts: One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
 7. Alarm Switch: One NO contact that operates only when circuit breaker has tripped.

2.6 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
 - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Outdoor Locations: NEMA 250, Type 3R.
 - 3. Kitchen or Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 - 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 - 5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Install fuses in fusible devices.
- D. Comply with NECA 1.

3.2 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262816

SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior solid-state luminaires that use LED technology.
 - 2. Lighting fixture supports.

1.2 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, arranged by designation.
- B. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale and coordinated with each other, using input from installers of the items involved:
- B. Product Certificates: For each type of luminaire.
- C. Sample warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.6 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Recessed Fixtures: Comply with NEMA LE 4.
- C. CRI of minimum 80. CCT of 3500k.
- D. Rated lamp life of 50,000 hours.
- E. Lamps dimmable from 100 percent to 0 percent of maximum light output.
- F. Internal driver.
- G. Nominal Operating Voltage: as specified on the drawings.
 - 1. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
- H. Housings:
 - 1. Extruded-aluminum housing and heat sink.
 - 2. Clear powder-coat finish.

2.2 MATERIALS

- A. Metal Parts:
 - 1. Free of burrs and sharp corners and edges.
 - 2. Sheet metal components shall be steel unless otherwise indicated.
 - 3. Form and support to prevent warping and sagging

- B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- C. Diffusers, and Globes:
 - 1. prismatic acrylic
 - 2. Acrylic: One hundred percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - 3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
- D. Housings:
 - 1. Extruded-aluminum housing and heat sink.
 - 2. Clear powder-coat finish.

2.3 METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.4 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.

- D. Supports: Sized and rated for luminaire weight.
- E. Flush-Mounted Luminaire Support: Secured to outlet box.
- F. Ceiling-Mounted Luminaire Support:
 - 1. Ceiling mount with two 5/32-inch- diameter aircraft cable supports adjustable to 120 inches in length.
- G. Suspended Luminaire Support:
 - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
 - 3. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
- H. Ceiling-Grid-Mounted Luminaires:
 - 1. Secure to any required outlet box.
 - 2. Secure luminaire using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
- I. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.
- J. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 - 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

END OF SECTION 265119

SECTION 280513 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. UTP cabling.
2. RS-232 cabling.
3. RS-485 cabling.
4. Control-voltage cabling.
5. Control-circuit conductors.
6. Fire alarm wire and cable.
7. Identification products.

1.2 DEFINITIONS

- A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

B. Shop Drawings:

1. Cabling administration drawings and printouts.
2. Wiring diagrams to show typical wiring schematics, including the following:
 - a. Cross-connects.
 - b. Patch panels.
 - c. Patch cords.

1.4 INFORMATIONAL SUBMITTALS

- A. Source quality-control reports.
- B. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An NRTL.
 - 1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 50 or less.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 BACKBOARDS

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels in Section 061000 "Rough Carpentry."

2.3 UTP CABLE

- A. Description: 100-ohm, four-pair UTP, covered with a blue thermoplastic jacket.
 - 1. Comply with ICEA S-90-661 for mechanical properties.
 - 2. Comply with TIA-568-C.1 for performance specifications.
 - 3. Comply with TIA-568-C.2, Category 6.

4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
 - a. Communications, General Purpose: Type CM or Type CMG.
 - b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
 - c. Communications, Riser Rated: Type CMR, complying with UL 1666.
 - d. Communications, Limited Purpose: Type CMX.
 - e. Multipurpose: Type MP or Type MPG.
 - f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
 - g. Multipurpose, Riser Rated: Type MPR, complying with UL 1666.

2.4 UTP CABLE HARDWARE

- A. UTP Cable Connecting Hardware: IDC type, using modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of the same category or higher.
- B. Connecting Blocks: 110-style for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

2.5 RS-232 CABLE

- A. Standard Cable: NFPA 70, Type CM.
 1. Three, No. 22 AWG, stranded (7x30) tinned copper conductors.
 2. Polypropylene insulation.
 3. Aluminum foil-polyester tape shield with 100 percent shield coverage.
 4. PVC jacket.
 5. Conductors are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
 6. Flame Resistance: Comply with UL 1581.
- B. Plenum-Rated Cable: NFPA 70, Type CMP.
 1. Three, No. 22 AWG, stranded (7x30) tinned copper conductors.

2. PE insulation.
3. Aluminum foil-polyester tape shield with 100 percent shield coverage.
4. Fluorinated ethylene propylene jacket.
5. Conductors are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

2.6 RS-485 CABLE

A. Standard Cable: NFPA 70, Type CM.

1. Paired, two pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262, Flame Test.

2.7 CONTROL-VOLTAGE CABLE

A. Paired Cable: NFPA 70, Type CMG.

1. One pair, twisted, No. 16 AWG, stranded (19x29) and No. 18 AWG, stranded (19x30) tinned copper conductors.

2. PVC insulation.
 3. Unshielded.
 4. PVC jacket.
 5. Flame Resistance: Comply with UL 1581.
- B. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
1. One pair, twisted, No. 16 AWG, stranded (19x29) and No. 18 AWG, stranded (19x30) tinned copper conductors.
 2. PVC insulation.
 3. Unshielded.
 4. PVC jacket.
 5. Flame Resistance: Comply with NFPA 262.

2.8 CONTROL-CIRCUIT CONDUCTORS

- A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in pathway.
- B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in pathway.
- C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF in pathway, complying with UL 83.

2.9 FIRE ALARM WIRE AND CABLE

- A. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.
- B. Signaling Line Circuits: Twisted, shielded pair, size as recommended by system manufacturer.
 1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a two-hour rating.

- C. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.
 - 1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.
 - 2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.
 - 3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor[with outer jacket] with red identifier stripe, NRTL listed for fire alarm and cable tray installation, plenum rated.

2.10 CONSOLIDATION POINTS

- A. Description: Consolidation points shall comply with requirements for cable connecting hardware.
 - 1. Number of Terminals per Field: One for each conductor in assigned cables.
 - 2. Number of Connectors per Field:
 - a. One for each four-pair UTP cable indicated.
 - b. One for each four-pair conductor group of indicated cables, plus 25 percent spare positions.
 - 3. Mounting: As indicated on the drawings.
 - 4. NRTL listed as complying with UL 50 and UL 1863.
 - 5. When installed in plenums used for environmental air, NRTL listed as complying with UL 2043.

2.11 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
- B. Comply with requirements in Section 260553 "Identification for Electrical Systems."

2.12 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test UTP and optical-fiber cables on reels according to TIA-568-C.1.

- C. Factory test UTP cables according to TIA-568-C.2.
- D. Cable will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for installation of supports for cables.

3.2 WIRING METHOD

- A. Install wiring in metal pathways and wireways.
 - 1. Minimum conduit size shall be 3/4 inch. Control and data-transmission wiring shall not share conduits with other building wiring systems.
 - 2. Comply with requirements in Section 280528 "Pathways for Electronic Safety and Security."
 - 3. Comply with requirements in Section 260536 "Cable Trays for Electrical Systems."
 - 4. Comply with requirements in Section 270536 "Cable Trays for Communications Systems."
- B. Install cable, concealed in accessible ceilings, walls, and floors when possible.
- C. Wiring on Racks and within Enclosures:
 - 1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM's "Cabling Termination Practices" chapter. Cable ties shall not be excessively tightened such that the transmission characteristics of the cable are altered.
 - 2. Install lacing bars and distribution spools.
 - 3. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer.
 - 4. Install conductors parallel with or at right angles to sides and back of enclosure.

5. Connect conductors associated with intrusion system that are terminated, spliced, or interrupted in any enclosure onto terminal blocks.
6. Mark each terminal according to system's wiring diagrams.
7. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1 and NFPA 70.
- B. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.
- C. Do not install conductors and cables that are wet, moisture damaged, or mold damaged.
- D. Install UTP cables and connecting materials after spaces are complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- E. General Requirements for Cabling:
 1. Comply with TIA-568-C.1.
 2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
 3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels. Leave a minimum of 6 inches of slack at outlet terminations and coil loosely into box after termination on outlet fitting.
 4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 5. Maintain minimum cable bending radius during installation and termination of cables.
 6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.

8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions. Do not exceed manufacturer's rated cable-pulling tension.
 9. Riser Cable: Riser cable support intervals shall be in accordance with manufacturer's recommendations.
 10. Comply with Section 280544 "Sleeves and Sleeve Seals for Electronic Safety and Security Pathways and Cabling."
- F. UTP Cable Installation: Install using techniques, practices, and methods that are consistent with Category 6 rating of components and that ensure Category 6 performance of completed and linked signal paths, end to end.
1. Comply with TIA-568-C.2.
 2. Install 110-style IDC termination hardware unless otherwise indicated.
 3. Do not untwist UTP cables more than 1/2 inch from point of termination to maintain cable geometry.
- G. Open-Cable Installation:
1. Install cabling with horizontal and vertical cable guides in telecommunication spaces with terminating hardware and interconnection equipment.
 2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart. Cable supports shall be fastened to structural members or floor slabs in accordance with Section 260529 "Hangers and Supports for Electrical Systems."
 3. Cable shall not be run in contact with pipes, ducts, or other potentially damaging items. Cables shall not be run through structural members or use structural members, pipes, ducts, or equipment as a support.
- H. Installation of Cable Routed Exposed under Raised Floors:
1. Install plenum-rated cable only.
 2. Install cabling after the flooring system has been installed in raised floor areas.
 3. Cable 72 inches long shall be neatly coiled not less than 12 inches in diameter below each feed point.
- I. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-C recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communication cables or cables in nonmetallic pathways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
3. Separation between communication cables in grounded metallic pathways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
4. Separation between cables in grounded metallic pathways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or hp and Larger: A minimum of 48 inches.
6. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.4 FIRE ALARM WIRING INSTALLATION

- A. Comply with NECA 1 and NFPA 72.
- B. Wiring Method: Install wiring in metal pathway according to Section 280528 "Pathways for Electronic Safety and Security."
 1. Install plenum cable in environmental air spaces, including plenum ceilings.

2. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated pathway system. This system shall not be used for any other wire or cable.

C. Wiring Method:

1. Cables and pathways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
2. Fire-Rated Cables: Use of two-hour, fire-rated fire alarm cables, NFPA 70, Types MI and CI, is not permitted.
3. Signaling Line Circuits: Power-limited fire alarm cables shall not be installed in the same cable or pathway as signaling line circuits.

- D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

- E. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

- F. Color Coding: Color code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm circuit wiring and another for supervisory circuits. Color code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

- G. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.

- H. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.5 POWER AND CONTROL-CIRCUIT CONDUCTORS

- A. 120-V Power Wiring: Install according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.

- B. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, No. 14 AWG.
2. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

3.6 CONNECTIONS

- A. Comply with requirements in Section 281643 "Perimeter Security Systems" for connecting, terminating, and identifying wires and cables.
- B. Comply with requirements in Section 281600 "Intrusion Detection" for connecting, terminating, and identifying wires and cables.
- C. Comply with requirements in Section 281300 "Access Control" for connecting, terminating, and identifying wires and cables.
- D. Comply with requirements in Section 282300 "Video Surveillance" for connecting, terminating, and identifying wires and cables.
- E. Comply with requirements in Section 284619 "PLC Electronic Detention Monitoring and Control Systems" for connecting, terminating, and identifying wires and cables.
- F. Comply with requirements in Section 283111 "Digital, Addressable Fire-Alarm System" for connecting, terminating, and identifying wires and cables.
- G. Comply with requirements in Section 283500 "Refrigerant Detection and Alarm" for connecting, terminating, and identifying wires and cables.

3.7 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-C, "Firestopping" Annex A.
- C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.8 GROUNDING

- A. For communication wiring, comply with J-STD-607-A and with BICSI TDMM's "Grounding, Bonding, and Electrical Protection" chapter.
- B. For low-voltage wiring and cabling, comply with requirements in Section 280526 "Grounding and Bonding for Electronic Safety and Security."

3.9 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.10 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Visually inspect UTP and optical-fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations to confirm color coding for pin assignments, and inspect cabling connections to confirm compliance with TIA-568-C.1.
 - 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 3. Test UTP cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross connection.
 - a. Test instruments shall comply with or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
- B. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.
- C. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 280513

SECTION 280526 - GROUNDING AND BONDING FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Grounding conductors.
 - 2. Grounding connectors.
 - 3. Grounding busbars.

1.2 DEFINITIONS

- A. Signal Ground: The ground reference point designated by manufacturer of the system that is considered to have zero voltage.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Comply with UL 486A-486B.
- B. Insulated Conductors: Stranded copper wire, green or green with yellow stripe insulation, insulated for 600 V, and complying with UL 83.
 - 1. Ground wire for custom-length equipment ground jumpers shall be No. 6 AWG, 19-strand, UL-listed, Type THHN wire.
- C. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.

3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kmils, 14 strands of No. 17 AWG conductor, and 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Tinned-copper tape, braided conductors terminated with two-hole copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 CONNECTORS

- A. Irreversible connectors listed for the purpose. Listed by an NRTL as complying with NFPA 70 for specific types, sizes, and combinations of conductors and other items connected. Comply with UL 486A-486B.
- B. Compression Wire Connectors: Crimp-and-compress connectors that bond to the conductor when the connector is compressed around the conductor. Comply with UL 467.
 1. Electroplated tinned copper, C and H shaped.
- C. Busbar Connectors: Cast silicon bronze, solderless compression or exothermic-type mechanical connector; with a long barrel and two holes spaced on 5/8- or 1-inch centers for a two-bolt connection to the busbar.
- D. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING BUSBARS

- A. Rack and Cabinet Grounding Busbars: Rectangular bars of hard-drawn solid copper, accepting conductors ranging from No. 14 to No. 2/0 AWG, NRTL listed as complying with UL 467, and complying with J-STD-607-A. Predrilling shall be with holes for use with lugs specified in this Section.
 1. Cabinet-Mounted Busbar: Terminal block, with stainless-steel or copper-plated hardware for attachment to the cabinet.
 2. Rack-Mounted Horizontal Busbar: Designed for mounting in 19- or 23-inch equipment racks. Include a copper splice bar for transitioning to an adjoining rack, and stainless-steel or copper-plated hardware for attachment to the rack.
 3. Rack-Mounted Vertical Busbar: 72 or 36 inches stainless-steel or copper-plated hardware for attachment to the rack.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with IEEE 1100, "Recommended Practice for Power and Grounding Electronic Equipment."
 - 1. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
 - 2. Bond shields and drain conductors to ground at only one point in each circuit.
- B. Signal Ground:
 - 1. For each system, establish the signal ground and label that location as such.
 - 2. Bond the signal ground to the alternating-current (ac) power system service by connecting to one of the following listed locations, using insulated No. 6 AWG, stranded, Type THHN wire:
 - a. Grounding bar in an electrical power panelboard if located in the same room or space as the signal ground.
 - b. Telecommunications grounding busbar.
- C. Comply with NECA 1.

3.2 APPLICATION

- A. Conductors: Install solid conductor for No. 8 AWG and smaller and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Grounding and Bonding Conductors:
 - 1. Install in the straightest and shortest route between the origination and termination point, and no longer than required. The bend radius shall not be smaller than eight times the diameter of the conductor. No one bend may exceed 90 degrees.
 - 2. Install without splices.
 - 3. Support at not more than 36-inch intervals.

3.3 CONNECTIONS

- A. Stacking of conductors under a single bolt is not permitted when connecting to busbars.

- B. Assemble the wire connector to the conductor, complying with manufacturer's written instructions and as follows:
 - 1. Use crimping tool and the die specific to the connector.
 - 2. Pretwist the conductor.
 - 3. Apply an antioxidant compound to all bolted and compression connections.
- C. Shielded Cable: Bond the shield of shielded cable to the signal ground. Comply with TIA/EIA-568-B.1 and TIA/EIA-568-B.2 when grounding screened, balanced, twisted-pair cables.
- D. Rack- and Cabinet-Mounted Equipment: Bond powered equipment chassis to the cabinet or rack grounding bar. Power connection shall comply with NFPA 70; the equipment grounding conductor in the power cord of cord- and plug-connected equipment shall be considered as a supplement to bonding requirements in this Section.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 280526

SECTION 280528 - PATHWAYS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetallic conduits, tubing, and fittings.
3. Optical-fiber-cable pathways and fittings.
4. Surface pathways.
5. Boxes, enclosures, and cabinets.
6. Handholes and boxes for exterior underground cabling.

B. Related Requirements:

1. Section 260533 "Raceways and Boxes for Electrical Systems" for conduits, wireways, surface raceways, boxes, enclosures, cabinets, handholes, and faceplate adapters serving electrical systems.
2. Section 270528 "Pathways for Communications Systems" for conduits, surface pathways, innerduct, boxes, and faceplate adapters serving communications systems.

1.2 ACTION SUBMITTALS

- A. Product Data: For surface pathways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets.

1.3 INFORMATIONAL SUBMITTALS

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

- B. GRC: Comply with ANSI C80.1 and UL 6.
- C. ARC: Comply with ANSI C80.5 and UL 6A.
- D. EMT: Comply with ANSI C80.3 and UL 797.
- E. FMC: Comply with UL 1; zinc-coated steel or aluminum.
- F. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 - 2. Fittings for EMT:
 - a. Material: Steel or die cast.
 - b. Type: Setscrew or compression.
 - 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.
- G. Joint Compound for GRC or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. General Requirements for Nonmetallic Conduits and Fittings:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Comply with TIA-569-B.
- B. ENT: Comply with NEMA TC 13 and UL 1653.
- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. Continuous HDPE: Comply with UL 651B.
- E. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

2.3 OPTICAL-FIBER-CABLE PATHWAYS AND FITTINGS

- A. Description: Comply with UL 2024; flexible-type pathway, approved for plenum riser or general-use installation unless otherwise indicated.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

2.4 SURFACE PATHWAYS

A. General Requirements for Surface Pathways:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

B. Surface Metal Pathways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish.

C. Surface Nonmetallic Pathways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors. Product shall comply with UL-94 V-0 requirements for self-extinguishing characteristics.

D. Tele-Power Poles:

1. Material: Galvanized steel with baked-enamel finish.
2. Fittings and Accessories: Dividers, end caps, covers, cutouts, wiring harnesses, devices, mounting materials, and other fittings shall match and mate with tele-power pole as required for complete system.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets:

1. Comply with TIA-569-B.
2. Boxes, enclosures and cabinets installed in wet locations shall be listed for use in wet locations.

B. Sheet-Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

E. Metal Floor Boxes:

1. Material: Cast or sheet metal.
2. Type: Fully adjustable.
3. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Nonmetallic Floor Boxes: Nonadjustable, round.

1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

I. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

J. Gangable boxes are prohibited.

K. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Plastic or fiberglass.
3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

M. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.
6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND CABLING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.

2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 3. Comply with TIA-569-B.
- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
1. Standard: Comply with SCTE 77.
 2. Configuration: Designed for flush burial with integral closed bottom unless otherwise indicated.
 3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
 4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 5. Cover Legend: Molded lettering, "ELECTRIC."
- C. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with covers of polymer concrete.
1. Standard: Comply with SCTE 77.
 2. Color of Frame and Cover: Gray.
 3. Configuration: Designed for flush burial with integral closed bottom unless otherwise indicated.
 4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
 5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 6. Cover Legend: Molded lettering, "ELECTRIC."

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

- A. Outdoors: Apply pathway products as specified below unless otherwise indicated:
1. Exposed Conduit: GRC.
 2. Concealed Conduit, Aboveground: GRC.
 3. Underground Conduit: RNC, Type EPC-80-PVC, concrete encased.
 4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply pathway products as specified below unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: EMT.
 2. Exposed, Not Subject to Severe Physical Damage: EMT.
 3. Exposed and Subject to Severe Physical Damage: GRC.
 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.

5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric-Solenoid, or Motor-Driven Equipment): FMC.
 6. Damp or Wet Locations: GRC.
 7. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical-fiber-cable pathway Plenum-type, communications-cable pathway EMT.
 8. Pathways for Optical-Fiber or Communications-Cable Risers in Vertical Shafts: Riser-type, optical-fiber-cable pathway Riser-type, communications-cable pathway EMT.
 9. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: General-use, optical-fiber-cable pathway Riser-type, optical-fiber-cable pathway Plenum-type, optical-fiber-cable pathway General-use, communications-cable pathway Riser-type, communications-cable pathway Plenum-type, communications-cable pathway EMT.
 10. Boxes and Enclosures: NEMA 250 Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.
- C. Minimum Pathway Size: 3/4-inch trade size. Minimum size for optical-fiber cables is 1 inch.
- D. Pathway Fittings: Compatible with pathways and suitable for use and location.
1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
 3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- F. Install surface pathways only where indicated on Drawings.
- G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.
- 3.2 INSTALLATION
- A. Comply with NECA 1, NECA 101, and TIA-569-B for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum pathways. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.
 - B. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.
 - C. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

- D. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications wiring conduits for which only two 90-degree bends are allowed. Support within 12 inches of changes in direction.
- E. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- F. Pathways Embedded in Slabs:
 - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot intervals.
 - 2. Arrange pathways to cross building expansion joints at right angles with expansion fittings.
 - 3. Arrange pathways to keep a minimum of 2 inches of concrete cover in all directions.
 - 4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
- G. Stub-ups to Above Recessed Ceilings:
 - 1. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- H. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.
- I. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.
- J. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- K. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to conduit assembly to assure a continuous ground path.
- L. Spare Pathways: Install pull wires in empty pathways. Cap underground pathways designated as spare above grade alongside pathways in use.
- M. Surface Pathways:
 - 1. Install surface pathway for surface electrical outlet boxes only where indicated on Drawings.
- N. Pathways for Optical-Fiber and Communications Cable: Install pathways as follows:
 - 1. 3/4-Inch Trade Size and Smaller: Install pathways in maximum lengths of 50 feet.
 - 2. 1-Inch Trade Size and Larger: Install pathways in maximum lengths of 75 feet.

3. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements.
- O. Install pathway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound.
- P. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:
1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 2. Where an underground service pathway enters a building or structure.
 3. Where otherwise required by NFPA 70.
- Q. Expansion-Joint Fittings:
1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - d. Attics: 135 deg F temperature change.
 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- R. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

- S. Mount boxes at heights indicated on Drawings according to ADA requirements. Install boxes with height measured to top of box unless otherwise indicated.
- T. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
5. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.
- C. Install handholes with bottom below frost line, below grade.
- D. Field cut openings for conduits according to enclosure manufacturer's written instructions.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRONIC SAFETY AND SECURITY PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electronic Safety and Security Pathways and Cabling."

3.6 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.7 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.

END OF SECTION 280528

SECTION 280544 - SLEEVES AND SLEEVE SEALS FOR ELECTRONIC SAFETY AND SECURITY PATHWAYS AND
CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves for pathway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. Sleeves for Rectangular Openings:
 - 1. Material: Galvanized-steel sheet.
 - 2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.
 - 1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Stainless steel.
 - 3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi, 28-day compressive strength.

- D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
- B. Silicone Foams: Multicomponent, silicone-based, liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and pathway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.

2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using [steel] [cast-iron] pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between pathway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at pathway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 280544

SECTION 283111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Heat detectors.
5. Notification appliances.
6. Addressable interface device.

1.2 SYSTEM DESCRIPTION

- A. Noncoded, addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only.

1.3 SUBMITTALS

A. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:
 - a. Trained and certified by manufacturer in fire-alarm system design.
 - b. NICET-certified fire-alarm technician, Level IV minimum.

B. Product Data: For each type of product indicated.

- C. Delegated-Design Submittal: For smoke and heat detectors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Drawings showing the location of each smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the detector.
2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72.

- D. Qualification Data: For qualified Installer.
- E. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.
- F. Field quality-control reports.
- G. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 - 1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
 - 2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
 - 3. Record copy of site-specific software.
 - 4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
 - a. Frequency of testing of installed components.
 - b. Frequency of inspection of installed components.
 - c. Requirements and recommendations related to results of maintenance.
 - d. Manufacturer's user training manuals.
 - 5. Manufacturer's required maintenance related to system warranty requirements.
 - 6. Abbreviated operating instructions for mounting at fire-alarm control unit.
 - 7. Copy of NFPA 25.
- H. Software and Firmware Operational Documentation:
 - 1. Software operating and upgrade manuals.
 - 2. Program Software Backup: On magnetic media or compact disk, complete with data files.
 - 3. Device address list.
 - 4. Printout of software application and graphic screens.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level IV technician.

- C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Devices must be compatible with current fire alarm system.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:
 - 1. Heat detectors.
 - 2. Smoke detectors.
- B. Fire-alarm signal shall initiate the following actions:
 - 1. Continuously operate alarm-notification appliances.

2.3 FIRE-ALARM CONTROL UNIT

- A. General Requirements for Fire-Alarm Control Unit:
 - 1. System must be reprogrammed as required to accommodate the new devices.
- B. Circuits:
 - 1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class A.
 - a. Initiating Device Circuits: to match existing circuiting
 - b. Notification Appliance Circuits: to match existing circuiting
 - c. Signaling Line Circuits: to match existing
 - d. Install no more than 50 addressable devices on each signaling line circuit.
 - 2. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class B.
 - a. Initiating Device Circuits: to match existing circuiting
 - b. Notification Appliance Circuits: to match existing circuiting

- c. Signaling Line Circuits: to match existing
 - d. Install no more than 50 addressable devices on each signaling line circuit.
- C. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.
- 1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.
- D. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
- 1. Batteries: to match existing

2.4 SYSTEM SMOKE DETECTORS

- A. General Requirements for System Smoke Detectors:
- 1. Shall match existing.

2.5 HEAT DETECTORS

- A. General Requirements for Heat Detectors: Comply with UL 521.
- B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.
- 1. To match existing
- C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F.
- 1. To match existing

2.6 NOTIFICATION APPLIANCES

- A. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.
- 1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.
- B. Chimes, Low-Level Output: Vibrating type, 75-dBA minimum rated output.

- C. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.
1. Rated Light Output:
 - a. 15/30/75/110 cd, selectable in the field.
 2. Mounting: Wall mounted unless otherwise indicated.
 3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
 4. Flashing shall be in a temporal pattern, synchronized with other units.
 5. Strobe Leads: Factory connected to screw terminals.
 6. Mounting Faceplate: Factory finished, to match existing

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72 for installation of fire-alarm equipment.
- B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.
1. Connect new equipment to existing control panel in existing part of the building.
 2. Connect new equipment to existing monitoring equipment at the supervising station.
 3. Expand, modify, and supplement existing control and monitoring equipment as necessary to extend existing control and monitoring functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.
- C. Smoke- or Heat-Detector Spacing:
1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
 2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
 3. Smooth ceiling spacing shall not exceed 30 feet.
 4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix Ain NFPA 72.
 5. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.
 6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.

- D. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.
- E. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.
- F. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.
- G. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.
- H. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.
- I. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling.
- J. Device Location-Indicating Lights: Locate in public space near the device they monitor.
- K. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches above the finished floor.

3.2 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- B. Install framed instructions in a location visible from fire-alarm control unit.

3.3 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.4 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by authorities having jurisdiction.
- B. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
 - b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
 2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
 4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
 5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
 6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
- C. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- D. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.
- F. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- G. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

END OF SECTION 283111

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Preparing subgrades for slabs-on-grade, walks, pavements.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for concrete slabs-on-grade.
4. Subbase course for concrete walks pavements.
5. Subbase course and base course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Sections:

1. Section 013233 "Photographic Documentation" for recording preexcavation and earth moving progress.
2. Section 015000 "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities; also for temporary site fencing if not in another Section.
3. Section 033000 "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.

1.3 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch-wide, maximum, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom; measured according to SAE J-1179.
 2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket; measured according to SAE J-732.
- I. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. or more in volume that exceed a standard penetration resistance of 100 blows/2 inches when tested by a geotechnical testing agency, according to ASTM D 1586.
- J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- K. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- L. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- M. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
1. Geotextiles.
 2. Controlled low-strength material, including design mixture.
 3. Geofoam.
 4. Warning tapes.

- B. Samples for Verification: For the following products, in sizes indicated below:
 - 1. Geotextile: 12 by 12 inches.
 - 2. Warning Tape: 12 inches long; of each color.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
 - 1. Classification according to ASTM D 2487.
 - 2. Laboratory compaction curve according to ASTM D 698.
- C. Blasting plan approved in advance by authorities having jurisdiction.
- D. Seismic survey report from seismic survey agency.
- E. Preexcavation Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.6 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.7 PROJECT CONDITIONS

- A. Utility Locator Service: Notify utility locator service "One Call" for area where Project is located before beginning earth moving operations.
- B. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Section 015000 "Temporary Facilities and Controls," are in place.
- C. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- D. Do not direct vehicle or equipment exhaust towards protection zones.
- E. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487 Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
 - 1. Liquid Limit: Refer to Structural Drawings.
 - 2. Plasticity Index: Refer to Structural Drawings.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487 Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- H. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.
- I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.
- J. Sand: ASTM C 33; fine aggregate.
- K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

- A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
1. Survivability: Class 2; AASHTO M 288.
 2. Grab Tensile Strength: 157 lbf; ASTM D 4632.
 3. Sewn Seam Strength: 142 lbf; ASTM D 4632.
 4. Tear Strength: 56 lbf; ASTM D 4533.
 5. Puncture Strength: 56 lbf; ASTM D 4833.
 6. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
 7. Permittivity: 0.5 per second, minimum; ASTM D 4491.
 8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
- B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
1. Survivability: Class 2; AASHTO M 288.
 2. Grab Tensile Strength: 247 lbf; ASTM D 4632.
 3. Sewn Seam Strength: 222 lbf; ASTM D 4632.
 4. Tear Strength: 90 lbf; ASTM D 4533.
 5. Puncture Strength: 90 lbf; ASTM D 4833.
 6. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
 7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
 8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 GEOFOAM

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, 1.55-lb/cu. ft. density, 25-psi compressive strength.
- B. Molded-Polystyrene Board Insulation: ASTM C 578, Type I, 0.90-lb/cu. ft. density, 10-psi compressive strength.
1. Manufacture molded polystyrene with an inorganic mineral registered with the EPA and suitable for application as a termite deterrent.
- C. Rigid Cellular Polystyrene Geof foam: ASTM D 6817, Type EPS 19, 1.15-lb/cu. ft. density, 5.8-psi compressive strength at 1 percent deformation; 16-psi compressive strength at 10 percent deformation.
- D. Connectors: Geof foam manufacturer's multibarbed, galvanized-steel sheet connectors.

2.4 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.
- B. Explosives: Obtain written permission from authorities having jurisdiction before bringing explosives to Project site or using explosives on Project site.
 1. Perform blasting without damaging adjacent structures, property, or site improvements.
 2. Perform blasting without weakening the bearing capacity of rock subgrade and with the least-practicable disturbance to rock to remain.

3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. 24 inches outside of concrete forms other than at footings.
 - b. 12 inches outside of concrete forms at footings.
 - c. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - e. 6 inches beneath bottom of concrete slabs-on-grade.
 - f. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
 3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
 1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
 3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
 4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- E. Trenches in Tree- and Plant-Protection Zones:
1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
 3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.8 SUBGRADE INSPECTION

- A. Notify Architect when excavations have reached required subgrade.
- B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
1. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
 - 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for Record Documents.
 - 3. Testing and inspecting underground utilities.
 - 4. Removing concrete formwork.
 - 5. Removing trash and debris.
 - 6. Removing temporary shoring and bracing, and sheeting.
 - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete"
- D. Trenches under Roadways: Provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Section 033000 "Cast-in-Place Concrete"
- E. Backfill voids with satisfactory soil while removing shoring and bracing.

- F. Place and compact initial backfill of subbase material satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
 - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- G. Controlled Low-Strength Material: Place initial backfill of controlled low-strength material to a height of 12 inches over the pipe or conduit. Coordinate backfilling with utilities testing.
- H. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- I. Controlled Low-Strength Material: Place final backfill of controlled low-strength material to final subgrade elevation.
- J. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.13 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use satisfactory soil material.
 - 3. Under steps and ramps, use engineered fill.
 - 4. Under building slabs, use engineered fill.
 - 5. Under footings and foundations, use engineered fill.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 GEOFOAM FILL

- A. Place a leveling course of sand, 2 inches thick, over subgrade. Finish leveling course to a tolerance of 1/2 inch when tested with a 10-foot straightedge.
 - 1. Place leveling course on subgrades free of mud, frost, snow, or ice.
- B. Install geofoam blocks in layers with abutting edges and ends and with the long dimension of each block at right angles to blocks in each subsequent layer. Offset joints of blocks in successive layers.
- C. Install geofoam connectors at each layer of geofoam to resist horizontal displacement according to geofoam manufacturer's written instructions.
- D. Cover geofoam with subdrainage geotextile before placing overlying soil materials.

3.15 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.16 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
 - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
 - 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
 - 3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
 - 4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.17 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Turf or Unpaved Areas: Plus or minus 1 inch.
 - 2. Walks: Plus or minus 1 inch.
 - 3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.18 SUBSURFACE DRAINAGE

- A. Subdrainage Pipe: Specified in Section 334600 "Subdrainage."

- B. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
 - 1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698 with a minimum of two passes of a plate-type vibratory compactor.
- C. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
 - 1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698 with a minimum of two passes of a plate-type vibratory compactor.
 - 2. Place and compact impervious fill over drainage backfill in 6-inch-thick compacted layers to final subgrade.

3.19 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
 - 1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
 - 2. Place base course material over subbase course under hot-mix asphalt pavement.
 - 3. Shape subbase course and base course to required crown elevations and cross-slope grades.
 - 4. Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
 - 5. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
 - 6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.
- C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.20 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
 - 1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
 - 2. Place drainage course 6 inches or less in compacted thickness in a single layer.

3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.21 FIELD QUALITY CONTROL

- A. Special Inspections: Owner may engage a qualified special inspector to perform the following special inspections at cost to the Contractor if it is determined that substandard work is noted:
 1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
 2. Determine that fill material and maximum lift thickness comply with requirements.
 3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.
- B. Testing Agency: Owner may engage a qualified geotechnical engineering testing agency to perform tests and inspections at cost to the Contractor if it is determined that substandard work is noted.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length, but no fewer than two tests.
 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.
- F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.22 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.23 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.
- B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.
 - 1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes temporary excavation support and protection systems.
- B. Related Requirements:
 - 1. Section 013233 "Photographic Documentation" for recording preexisting conditions and excavation support and protection system progress.
 - 2. Section 312000 "Earth Moving" for excavating and backfilling, for controlling surface-water runoff and ponding, and for dewatering excavations.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, performance properties, and dimensions of individual components and profiles, and calculations for excavation support and protection system.
- B. Shop Drawings: For excavation support and protection system, prepared by or under the supervision of a qualified professional engineer.
 - 1. Include plans, elevations, sections, and details.
 - 2. Show arrangement, locations, and details of soldier piles, piling, lagging, tiebacks, bracing, and other components of excavation support and protection system according to engineering design.
 - 3. Indicate type and location of waterproofing.
 - 4. Include a written plan for excavation support and protection, including sequence of construction of support and protection coordinated with progress of excavation.
- C. Delegated-Design Submittal: For excavation support and protection systems, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For the following:
 - 1. Land surveyor.
- B. Contractor Calculations: For excavation support and protection system. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

- C. Existing Conditions: Using photographs, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by inadequate performance of excavation support and protection systems. Submit before Work begins.

1.5 CLOSEOUT SUBMITTALS

- A. Record Drawings: Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions.

1.6 FIELD CONDITIONS

- A. Interruption of Existing Utilities: Do not interrupt any utility-serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
 - 1. Notify Architect no fewer than two days in advance of proposed interruption of utility.
 - 2. Do not proceed with interruption of utility without Architect's written permission.
- B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks, and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design excavation support and protection systems to resist all lateral loading and surcharge, including but not limited to, retained soil, groundwater pressure, adjacent building loads, adjacent traffic loads, construction traffic loads, material stockpile loads, and seismic loads, based on the following:
 - 1. Compliance with OSHA Standards and interpretations, 29 CFR 1926, Subpart P.
 - 2. Compliance with AASHTO Standard Specification for Highway Bridges or AASHTO LRFD Bridge Design Specification, Customary U.S. Units.
 - 3. Compliance with requirements of authorities having jurisdiction.
 - 4. Compliance with utility company requirements.
 - 5. Compliance with railroad requirements.

2.2 MATERIALS

- A. Provide materials that are either new or in serviceable condition.
- B. Structural Steel: ASTM A36/A36M, ASTM A690/A690M, or ASTM A992/A992M.
- C. Steel Sheet Piling: ASTM A328/A328M, ASTM A572/A572M, or ASTM A690/A690M; with continuous interlocks.
 - 1. Corners: Site-fabricated mechanical interlock.

- D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of [size and strength required for application] [**3 inches**] [**4 inches**] <Insert dimension>.
- E. Shotcrete: Comply with Section 033713 "Shotcrete" for shotcrete materials and mixes, reinforcement, and shotcrete application.
- F. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.
- G. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- H. Tiebacks: Steel bars, ASTM A722/A722M.
- I. Tiebacks: Steel strand, ASTM A416/A416M.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
 - 1. Shore, support, and protect utilities encountered.

3.2 INSTALLATION - GENERAL

- A. Locate excavation support and protection systems clear of permanent construction, so that construction and finishing of other work is not impeded.
- B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.

3.3 SOLDIER PILES AND LAGGING

- A. Install steel soldier piles before starting excavation.
 - 1. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement.
 - 2. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging.
 - 3. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

- B. Install wood lagging within flanges of soldier piles as excavation proceeds.
 - 1. Trim excavation as required to install lagging.
 - 2. Fill voids behind lagging with soil, and compact.
- C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

3.4 SHEET PILING

- A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock vertical edges to form a continuous barrier.
- B. Accurately place the piling using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer.
 - 1. Limit vertical offset of adjacent sheet piling to 60 inches.
 - 2. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.
- C. Cut tops of sheet piling to uniform elevation at top of excavation.

3.5 TIEBACKS

- A. Drill, install, grout, and tension tiebacks.
- B. Test load-carrying capacity of each tieback, and replace and retest deficient tiebacks.
 - 1. Have test loading observed by a qualified professional engineer responsible for design of excavation support and protection system.
- C. Maintain tiebacks in place until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.6 BRACING

- A. Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.
 - 1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect.
 - 2. Install internal bracing if required to prevent spreading or distortion of braced frames.
 - 3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.7 MAINTENANCE

- A. Monitor and maintain excavation support and protection system.
- B. Prevent surface water from entering excavations by grading, dikes, or other means.

- C. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and constructed slopes and to ensure that damage to permanent structures is prevented.

3.8 FIELD QUALITY CONTROL

- A. Survey-Work Benchmarks: Resurvey benchmarks regularly during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open.
 - 1. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions.
 - 2. Promptly notify Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.
- B. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that excavation support and protection system remains stable.
- C. Promptly repair damages to adjacent facilities caused by installation or faulty performance of excavation support and protection systems.

3.9 REMOVAL AND REPAIRS

- A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures.
 - 1. Remove in stages to avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.
 - 2. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction, and abandon remainder.
 - 3. Fill voids immediately with approved backfill compacted to density specified in Section 312000 "Earth Moving."
 - 4. Repair or replace, as approved by Architect, adjacent work damaged or displaced by removing excavation support and protection systems.
- B. Leave excavation support and protection systems permanently in place.

END OF SECTION 315000

SECTION 321400 - UNIT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Brick pavers set in aggregate setting beds.
 - 2. Steel edge restraints.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For materials other than water and aggregates.
- B. Product Data: For the following:
 - 1. Pavers.
 - 2. Edge restraints.
- C. Sieve Analyses: For aggregate setting-bed materials, according to ASTM C 136.
- D. Samples for Initial Selection: For each type of unit paver indicated and the following:
 - 1. Joint materials involving color selection.
 - 2. Exposed edge restraints involving color selection.
- E. Samples for Verification: For full-size units of each type of unit paver indicated. Assemble no fewer than five Samples of each type of unit on suitable backing and grout joints. Include Samples of the following:
 - 1. Joint materials.
 - 2. Exposed edge restraints.

1.5 INFORMATIONAL SUBMITTALS

- A. Adhesion and Compatibility Test Reports: From latex-additive manufacturer for mortar and grout containing latex additives.
- B. Material Certificates: For unit pavers. Include statements of material properties indicating compliance with requirements, including compliance with standards. Provide for each type and size of unit.

- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for unit pavers, indicating compliance with requirements.
 - 1. For solid interlocking paving units, include test data for freezing and thawing according to ASTM C 67.

1.6 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Submit to latex-additive manufacturer, for testing as indicated below, Samples of flooring materials that will contact or affect mortar and grout that contain latex additives.
 - 1. Use manufacturer's standard test methods to determine whether mortar and grout materials will obtain optimal adhesion with, and will be nonstaining to, installed brick and other materials constituting brick flooring installation.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store liquids in tightly closed containers protected from freezing.

1.9 FIELD CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.
- B. Weather Limitations for Bituminous Setting Bed:
 - 1. Install bituminous setting bed only when ambient temperature is above 40 deg F and when base is dry.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

2.2 BRICK PAVERS

- A. Brick Pavers: Light-traffic paving brick; ASTM C 902, Class SX, Type I, Application PS. Provide brick without frogs or cores in surfaces exposed to view in the completed Work.
1. Thickness: 3 inches.
 2. Face Size: 3 by 9 inches.
 3. Color: As selected by Architect from manufacturer's full range.
 4. Pattern: Herringbone.
- B. Efflorescence: Brick shall be rated "not effloresced" when tested according to ASTM C 67.
- C. Temporary Protective Coating: Precoat exposed surfaces of brick pavers with a continuous film of a temporary protective coating that is compatible with brick, mortar, and grout products and can be removed without damaging grout or brick. Do not coat unexposed brick surfaces; handle brick to prevent coated surfaces from contacting backs or edges of other units. If, despite these precautions, coating does contact bonding surfaces of brick, remove coating from bonding surfaces before setting brick.

2.3 CURBS AND EDGE RESTRAINTS

- A. Steel Edge Restraints: Manufacturer's standard painted steel edging 3/16 inch (4.8 mm) thick by 4 inches (100 mm) high with loops pressed from or welded to face to receive stakes at 36 inches (900 mm) o.c. and steel stakes 15 inches (380 mm) long for each loop.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. [Border Concepts, Inc.](#)
 - b. [Collier Metal Specialties, Inc.](#)
 - c. [Sure-loc Edging Corporation.](#)
 2. Color: As selected by Architect from manufacturer's full range.

2.4 ACCESSORIES

- A. Cork Joint Filler: Preformed strips complying with ASTM D 1752, Type II.
- B. Compressible Foam Filler: Preformed strips complying with ASTM D 1056, Grade 2A1.

2.5 AGGREGATE SETTING-BED MATERIALS

- A. Graded Aggregate for Subbase: Sound, crushed stone or gravel complying with ASTM D 448 for Size No. 57.

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- B. Graded Aggregate for Base: Sound, crushed stone or gravel complying with ASTM D 448 for Size No. 8.
- C. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C 33/C 33M for fine aggregate.
- D. Stone Screenings for Leveling Course: Sound stone screenings complying with ASTM D 448 for Size No. 10.
- E. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 sieve and no more than 10 percent passing No. 200 sieve.
 - 1. Provide sand of color needed to produce required joint color.
- F. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications; made from polyolefins or polyesters, with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
 - 1. Survivability: Class 2, AASHTO M 288.
 - 2. Apparent Opening Size: No. 60 sieve, maximum; ASTM D 4751.
 - 3. Permittivity: 0.02 per second, minimum; ASTM D 4491.
 - 4. UV Stability: 50 percent after 500 hours' exposure, ASTM D 4355.
- G. Drainage Geotextile: Nonwoven needle-punched geotextile fabric, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
 - 1. Survivability: Class 2, AASHTO M 288.
 - 2. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
 - 3. Permittivity: 0.5 per second, minimum; ASTM D 4491.
 - 4. UV Stability: 50 percent after 500 hours' exposure, ASTM D 4355.
- H. Herbicide: Commercial chemical for weed control, registered with the EPA. Provide in granular, liquid, or wettable powder form.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces indicated to receive unit paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Where unit paving is to be installed over waterproofing, examine waterproofing installation, with waterproofing Installer present, for protection from paving operations, including areas where waterproofing system is turned up or flashed against vertical surfaces.
- C. Proceed with installation only after unsatisfactory conditions have been corrected and waterproofing protection is in place.

3.2 PREPARATION

- A. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.
- B. Sweep concrete substrates to remove dirt, dust, debris, and loose particles.
- C. Proof-roll prepared subgrade according to requirements in Section 312000 "Earth Moving" to identify soft pockets and areas of excess yielding. Proceed with unit paver installation only after deficient subgrades have been corrected and are ready to receive subbase and base course for unit pavers.

3.3 INSTALLATION, GENERAL

- A. Do not use unit pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.
- B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.
- D. Handle protective-coated brick pavers to prevent coated surfaces from contacting backs or edges of other units. If, despite these precautions, coating does contact bonding surfaces of brick, remove coating from bonding surfaces before setting brick.
- E. Joint Pattern: Running bond for the brick pavers or as indicated.
- F. Tolerances: Do not exceed 1/32-inch unit-to-unit offset from flush (lippage) or 1/8 inch in 10 feet from level, or indicated slope, for finished surface of paving.
- G. Expansion and Control Joints: Provide for sealant-filled joints at locations and of widths indicated. Provide compressible foam filler as backing for sealant-filled joints unless otherwise indicated; where unfilled joints are indicated, provide temporary filler until paver installation is complete. Install joint filler before setting pavers. Sealant materials and installation are specified in Section 079200 "Joint Sealants."
- H. Provide edge restraints as indicated. Install edge restraints before placing unit pavers.
 - 1. Install edge restraints to comply with manufacturer's written instructions. Install stakes at intervals required to hold edge restraints in place during and after unit paver installation.
- I. Provide steps made of pavers as indicated. Install paver steps before installing adjacent pavers.
 - 1. Where pavers set in mortar bed are indicated for steps constructed adjacent to pavers set in aggregate setting bed, install steps and allow mortar to cure before placing aggregate setting bed and remainder of pavers. Cut off mortar bed at a steep angle so it will not interfere with aggregate setting bed.

3.4 AGGREGATE SETTING-BED APPLICATIONS

- A. Compact soil subgrade uniformly to at least 95 percent of ASTM D 698 laboratory density.
- B. Proof-roll prepared subgrade to identify soft pockets and areas of excess yielding. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- C. Place separation geotextile over prepared subgrade, overlapping ends and edges at least 12 inches.
- D. Place aggregate subbase and base, compact by tamping with plate vibrator, and screed to depth indicated.
- E. Place drainage geotextile over compacted base course, overlapping ends and edges at least 12 inches.
- F. Place leveling course and screed to a thickness of 1 to 1-1/2 inches, taking care that moisture content remains constant and density is loose and uniform until pavers are set and compacted.
- G. Treat leveling course with herbicide to inhibit growth of grass and weeds.
- H. Set pavers with a minimum joint width of 1/16 inch and a maximum of 1/8 inch, being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch with pieces cut to fit from full-size unit pavers.
- I. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf compaction force at 80 to 90 Hz. Use vibrator with neoprene mat on face of plate or other means as needed to prevent cracking and chipping of pavers. Perform at least three passes across paving with vibrator.
 - 1. Compact pavers when there is sufficient surface to accommodate operation of vibrator, leaving at least 36 inches of uncompacted pavers adjacent to temporary edges.
 - 2. As work progresses to perimeter of installation, compact installed pavers that are adjacent to permanent edges unless they are within 36 inches of laying face.
 - 3. Before ending each day's work and when rain interrupts work, cover pavers that have not been compacted and cover leveling course on which pavers have not been placed with nonstaining plastic sheets to protect them from rain.
- J. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.
- K. Do not allow traffic on installed pavers until sand has been vibrated into joints.
- L. Repeat joint-filling process 30 days later.

3.5 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
- B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.
- C. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.
 - 1. Remove temporary protective coating as recommended by coating manufacturer and as acceptable to paver and grout manufacturers.
 - 2. Do not allow protective coating to enter floor drains. Trap, collect, and remove coating material.

END OF SECTION 321400

SECTION 321713 - PARKING BUMPERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
1. Precast concrete wheel stops.

1.3 ACTION SUBMITTALS

- A. Product Data:
1. Precast concrete wheel stops.
- B. Samples for Initial Selection: For each type of exposed finish requiring color selection.
- C. Samples for Verification: For wheel stops, 6 inches long, showing color and cross section; with mounting hardware.

PART 2 - PRODUCTS

2.1 PARKING BUMPERS

- A. Precast Concrete Wheel Stops: Precast, steel-reinforced, air-entrained concrete; 4000-psi minimum compressive strength; 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners, transverse drainage slots on underside, and a minimum of two factory-formed or -drilled vertical holes through wheel stop for anchoring to substrate.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. [American Eagle Precast, LLC.](#)
 - b. [American Precast Concrete Inc.](#)
 - c. [Cast-Crete USA, Inc.](#)
 - d. [Oldcastle Infrastructure Inc.; CRH Americas.](#)
 2. Source Limitations: Obtain wheel stops from single source from single manufacturer.
 3. Surface Appearance: Smooth, free of pockets, sand streaks, honeycombs, and other obvious defects. Corners shall be uniform, straight, and sharp.
 4. Surface Sealer: Manufacturer's standard salt-resistant, clear sealer, applied at precasting location.
 5. Mounting Hardware: Galvanized-steel spike or dowel, 1/2-inch diameter, 14-inch minimum length or hardware as standard with wheel-stop manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement is in suitable condition to begin installation in accordance with manufacturer's written instructions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install wheel stops in accordance with manufacturer's written instructions unless otherwise indicated.
- B. Install wheel stops in bed of adhesive before anchoring to substrate.
- C. Securely anchor wheel stops to substrate with hardware in each preformed vertical hole in wheel stop as recommended in writing by manufacturer. Recess head of hardware beneath top of wheel stop.

END OF SECTION 321713

SECTION 321723 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Painted markings applied to asphalt paving.

1.3 ACTION SUBMITTALS

- A. Product Data: Include technical data and tested physical and performance properties.
 - 1. Pavement-marking paint, alkyd.
- B. Shop Drawings:
 - 1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.
 - 2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.
- C. Samples: For each exposed product and for each color and texture specified; on rigid backing, 8 inches square.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of Federal DOT Standards for pavement-marking work.
 - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for alkyd materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. [Conco Paints](#).
2. [Dow Chemical Company \(The\)](#).
3. [Sherwin-Williams Company \(The\)](#).
4. Approved Equal.

B. Source Limitations: Obtain pavement-marking paints from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: Comply with applicable provisions in [the USDOJ's "2010 ADA Standards for Accessible Design"] [the ABA standards of the Federal agency having jurisdiction] [and] [ICC A117.1] <Insert requirement>.

2.3 PAVEMENT-MARKING PAINT

A. Pavement-Marking Paint, Alkyd: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248, Type N; colors complying with FS TT-P-1952F.

1. Color: White and Blue.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement-marking substrate is dry and in suitable condition to begin pavement marking in accordance with manufacturer's written instructions.
- B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

3.2 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow asphalt paving or concrete surfaces to age for a minimum of 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
 1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to asphalt paving or concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.
 2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal..

3.3 PROTECTING AND CLEANING

- A. Protect pavement markings from damage and wear during remainder of construction period.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 321723

SECTION 329113 - SOIL PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes planting soils specified by composition of the mixes.

1.3 DEFINITIONS

- A. AAPFCO: Association of American Plant Food Control Officials.
- B. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.
- C. CEC: Cation exchange capacity.
- D. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.
- E. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.
- F. Imported Soil: Soil that is transported to Project site for use.
- G. Layered Soil Assembly: A designed series of planting soils, layered on each other, that together produce an environment for plant growth.
- H. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.
- I. NAPT: North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.
- J. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."

- K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- L. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.
- M. SSSA: Soil Science Society of America.
- N. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- O. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- P. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- Q. USCC: U.S. Composting Council.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include recommendations for application and use.
 - 2. Include test data substantiating that products comply with requirements.
 - 3. Include sieve analyses for aggregate materials.
 - 4. Material Certificates: For each type of imported soil and soil amendment and fertilizer before delivery to the site, according to the following:
 - a. Manufacturer's qualified testing agency's certified analysis of standard products.
 - b. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.
 - c. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.
- B. Samples: For each bulk-supplied material, 1-quart volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For each testing agency.
- B. Preconstruction Test Reports: For preconstruction soil analyses specified in "Preconstruction Testing" Article.
- C. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction soil analyses on existing, on-site soil.
 - 1. Notify Architect seven days in advance of the dates and times when laboratory samples will be taken.
- B. Preconstruction Soil Analyses: For each unamended soil type, perform testing on soil samples and furnish soil analysis and a written report containing soil-amendment and fertilizer recommendations by a qualified testing agency performing the testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.
 - 1. Have testing agency identify and label samples and test reports according to sample collection and labeling requirements.

1.8 SOIL-SAMPLING REQUIREMENTS

- A. General: Extract soil samples according to requirements in this article.
- B. Sample Collection and Labeling: Have samples taken and labeled by [Owner] [Contractor in presence of Architect] [soil scientist (CPSS) certified by SSSA] [soil classifier (CPSC) certified by SSSA] [soil scientist (RPSS) registered by the National Society of Consulting Soil Scientists] [or] [state-certified, -licensed, or -registered soil scientist] <Insert requirement> under the direction of the testing agency.
 - 1. Number and Location of Samples: Minimum of eight representative soil samples from varied locations where directed by Architect for each soil to be used or amended for landscaping purposes.
 - 2. Procedures and Depth of Samples: According to USDA-NRCS's "Field Book for Describing and Sampling Soils."
 - 3. Division of Samples: Split each sample into two, equal parts. Send half to the testing agency and half to Owner for its records.
 - 4. Labeling: Label each sample with the date, location keyed to a site plan or other location system, visible soil condition, and sampling depth.

1.9 TESTING REQUIREMENTS

- A. General: Perform tests on soil samples according to requirements in this article.
- B. Physical Testing:
 - 1. Soil Texture: Soil-particle, size-distribution analysis by one of the following methods according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods":

- a. Sieving Method: Report sand-gradation percentages for very coarse, coarse, medium, fine, and very fine sand; and fragment-gradation (gravel) percentages for fine, medium, and coarse fragments; according to USDA sand and fragment sizes.
 - b. Hydrometer Method: Report percentages of sand, silt, and clay.
 2. Total Porosity: Calculate using particle density and bulk density according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
 3. Water Retention: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
 4. Saturated Hydraulic Conductivity: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods"; at 85% compaction according to ASTM D698 (Standard Proctor).
- C. Chemical Testing:
1. CEC: Analysis by sodium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."
 2. Clay Mineralogy: Analysis and estimated percentage of expandable clay minerals using CEC by ammonium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 1- Physical and Mineralogical Methods."
 3. Phytotoxicity: Test for plant-available concentrations of phytotoxic minerals including aluminum, arsenic, barium, cadmium, chlorides, chromium, cobalt, copper, lead, lithium, mercury, nickel, selenium, silver, sodium, strontium, tin, titanium, vanadium, and zinc.
- D. Fertility Testing: Soil-fertility analysis according to standard laboratory protocol of SSSA NAPT NCR-13, including the following:
1. Percentage of organic matter.
 2. CEC, calcium percent of CEC, and magnesium percent of CEC.
 3. Soil reaction (acidity/alkalinity pH value).
 4. Buffered acidity or alkalinity.
 5. Nitrogen ppm.
 6. Phosphorous ppm.
 7. Potassium ppm.
 8. Manganese ppm.
 9. Manganese-availability ppm.
 10. Zinc ppm.
 11. Zinc availability ppm.
 12. Copper ppm.
 13. Sodium ppm and sodium absorption ratio.
 14. Soluble-salts ppm.
 15. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
 16. Other deleterious materials, including their characteristics and content of each.
- E. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."

- F. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.
1. Fertilizers and Soil Amendment Rates: State recommendations in weight per 1000 sq. ft. for 6-inch depth of soil.
 2. Soil Reaction: State the recommended liming rates for raising pH or sulfur for lowering pH according to the buffered acidity or buffered alkalinity in weight per 1000 sq. ft. for 6-inch depth of soil.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.
- B. Bulk Materials:
1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 3. Do not move or handle materials when they are wet or frozen.
 4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

PART 2 - PRODUCTS

2.1 PLANTING SOILS SPECIFIED BY COMPOSITION

- A. General: Soil amendments, fertilizers, and rates of application specified in this article are guidelines that may need revision based on testing laboratory's recommendations after preconstruction soil analyses are performed.
- B. Planting-Soil Type: Existing, on-site surface soil, with the duff layer, if any, retained; and stockpiled on-site; modified to produce viable planting soil. Blend existing, on-site surface soil with the following soil amendments and fertilizers in the following quantities to produce planting soil:
1. Ratio of Loose Compost to Soil: 1:4 by volume.
 2. Weight of Lime: 1000 sq. ft. for 6-inch depth of soil.

2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
1. Class: T, with a minimum of 99 percent passing through a No. 8 sieve and a minimum of 75 percent passing through a No. 60 sieve.

2. Class: O, with a minimum of 95 percent passing through a No. 8 sieve and a minimum of 55 percent passing through a No. 60 sieve.
 3. Form: Provide lime in form of ground dolomitic limestone.
- B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 sieve and a maximum of 10 percent passing through a No. 40 sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Perlite: Horticultural perlite, soil amendment grade.
- E. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 sieve.
- F. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C33/C33M.

2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:
1. Feedstock: Limited to leaves.
 2. Reaction: pH of 5.5 to 8.
 3. Soluble-Salt Concentration: Less than 4 dS/m.
 4. Moisture Content: 35 to 55 percent by weight.
 5. Organic-Matter Content: 30 to 40 percent of dry weight.
 6. Particle Size: Minimum of 98 percent passing through a 4-inch sieve.
- B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture with 100 percent passing through a 1/2-inch sieve, a pH of 3.4 to 4.8, and a soluble-salt content measured by electrical conductivity of maximum 5 dS/m.
- C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture with 100 percent passing through a 1/2-inch sieve, a pH of 6 to 7.5, a soluble-salt content measured by electrical conductivity of maximum 5 dS/m, having a water-absorbing capacity of 1100 to 2000 percent, and containing no sand.
- D. Wood Derivatives: Shredded and composted, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.
1. Partially Decomposed Wood Derivatives: In lieu of shredded and composted wood derivatives, mix shredded and partially decomposed wood derivatives with ammonium nitrate at a minimum rate of 0.15 lb/cu. ft. of loose sawdust or ground bark, or with ammonium sulfate at a minimum rate of 0.25 lb/cu. ft. of loose sawdust or ground bark.

- E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.4 FERTILIZERS

- A. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of [20] [33] [50] percent available phosphoric acid.
- B. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
- C. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
- D. Chelated Iron: Commercial-grade FeEDDHA for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.

PART 3 - EXECUTION

3.1 GENERAL

- A. Place planting soil and fertilizers according to requirements in other Specification Sections.
- B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.
- C. Proceed with placement only after unsatisfactory conditions have been corrected.

3.2 PREPARATION OF UNAMENDED, ON-SITE SOIL BEFORE AMENDING

- A. Excavation: Excavate soil from designated area(s) to a depth of 6 inches and stockpile until amended.
- B. Unacceptable Materials: Clean soil of concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
- C. Unsuitable Materials: Clean soil to contain a maximum of 8 percent by dry weight of stones, roots, plants, sod, clay lumps, and pockets of coarse sand.

- D. Screening: Pass unamended soil through a 2-inch sieve to remove large materials.

3.3 PLACING AND MIXING PLANTING SOIL OVER EXPOSED SUBGRADE

- A. General: Apply and mix unamended soil with amendments on-site to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Subgrade Preparation: Till subgrade to a minimum depth of 6 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. Apply, add soil amendments, and mix approximately half the thickness of unamended soil over prepared, loosened subgrade according to "Mixing" Paragraph below. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil.
- C. Mixing: Spread unamended soil to total depth of 6 inches, but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
 - 1. Amendments: Apply soil amendments, except compost, and fertilizer, if required, evenly on surface, and thoroughly blend them with unamended soil to produce planting soil.
 - a. Mix lime and sulfur with dry soil before mixing fertilizer.
 - b. Mix fertilizer with planting soil no more than seven days before planting.
 - 2. Lifts: Apply and mix unamended soil and amendments in lifts not exceeding 8 inches in loose depth for material compacted by compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers.
- D. Compaction: Compact each blended lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D698 and tested in-place except where a different compaction value is indicated on Drawings.
- E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.4 BLENDING PLANTING SOIL IN PLACE

- A. General: Mix amendments with in-place, unamended soil to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Preparation: Till unamended, existing soil in planting areas to a minimum depth of 6 inches. Remove stones larger than 1-1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
- C. Mixing: Apply soil amendments, except compost, and fertilizer, if required, evenly on surface, and thoroughly blend them into full depth of unamended, in-place soil to produce planting soil.
 - 1. Mix lime and sulfur with dry soil before mixing fertilizer.
 - 2. Mix fertilizer with planting soil no more than seven days before planting.

- D. Compaction: Compact blended planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D698 except where a different compaction value is indicated on Drawings.
- E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.5 APPLYING COMPOST TO SURFACE OF PLANTING SOIL

- A. Application: Apply compost component of planting-soil mix 6 inches of compost to surface of in-place planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Finish Grading: Grade surface to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests:
 - 1. Compaction: Test planting-soil compaction after placing each lift and at completion using a densitometer or soil-compaction meter calibrated to a reference test value based on laboratory testing according to ASTM D698. Space tests at no less than one for each 1000 sq. ft. of in-place soil or part thereof.
- C. Soil will be considered defective if it does not pass tests.
- D. Prepare test reports.
- E. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

3.7 PROTECTION

- A. Protection Zone: Identify protection zones according to Section 015639 "Temporary Tree and Plant Protection."
- B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Vehicle traffic.
 - 4. Foot traffic.
 - 5. Erection of sheds or structures.
 - 6. Impoundment of water.
 - 7. Excavation or other digging unless otherwise indicated.

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- C. If planting soil or subgrade is overcompacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Architect and replace contaminated planting soil with new planting soil.

3.8 CLEANING

- A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.
 - 1. Dispose of excess subsoil and unsuitable materials on-site where directed by Owner.

END OF SECTION 329113

SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Seeding.
 - 2. Erosion-control material(s).

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
- C. Product Certificates: For fertilizers, from manufacturer.
- D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk materials with appropriate certificates.

1.6 FIELD CONDITIONS

- A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species:
 - 1. Quality: Seed of grass species as listed below for solar exposure, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
 - 2. Full Sun: Kentucky bluegrass (*Poa pratensis*), a minimum of three cultivars.
 - 3. Sun and Partial Shade: Proportioned by weight as follows:
 - a. 50 percent Kentucky bluegrass (*Poa pratensis*).
 - b. 30 percent chewings red fescue (*Festuca rubra* variety).
 - c. 10 percent perennial ryegrass (*Lolium perenne*).
 - d. 10 percent redtop (*Agrostis alba*).
 - 4. Shade: Proportioned by weight as follows:
 - a. 50 percent chewings red fescue (*Festuca rubra* variety).
 - b. 35 percent rough bluegrass (*Poa trivialis*).
 - c. 15 percent redtop (*Agrostis alba*).

2.2 FERTILIZERS

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
- B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.3 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

2.4 PESTICIDES

- A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.5 EROSION-CONTROL MATERIALS

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 3. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 - 1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
 - 2. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 PREPARATION FOR EROSION-CONTROL MATERIALS

- A. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.
- B. Fill cells of erosion-control mat with planting soil and compact before planting.
- C. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.
- D. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.4 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.
 - 1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 2. Do not use wet seed or seed that is moldy or otherwise damaged.
 - 3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at a total rate of 3 to 4 lb/1000 sq. ft..
- C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets installed and stapled according to manufacturer's written instructions.
- E. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
 - 1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.

3.5 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.6 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.
- C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- D. Remove nondegradable erosion-control measures after grass establishment period.

END OF SECTION 329200

SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Plants.
2. Tree stabilization.
3. Tree-watering devices.
4. Landscape edgings.
5. Tree grates.

B. Related Requirements:

1. Section 329200 "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.

1.3 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.
- C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.
- D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than the minimum root spread according to ANSI Z60.1 for type and size of plant required.
- E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

- F. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.
- G. Finish Grade: Elevation of finished surface of planting soil.
- H. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.
- I. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- J. Planting Area: Areas to be planted.
- K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- L. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- M. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- N. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- O. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 COORDINATION

- A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
 - 1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
 - 2. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 20 plants are required,

include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.

- B. Samples for Verification: For each of the following:
1. Organic Mulch: 1-pint volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
 2. Weed Control Barrier: 12 by 12 inches.
 3. Edging Materials and Accessories: Manufacturer's standard size, to verify color selected.
 4. Root Barrier: Width of panel by 12 inches.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
- B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
1. Manufacturer's certified analysis of standard products.
 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- C. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.
- D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.
1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
 2. Experience: Three years' experience in landscape installation in addition to requirements in Section 014000 "Quality Requirements."
 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 4. Pesticide Applicator: State licensed, commercial.

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- B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
 - 1. Selection of plants purchased under allowances is made by Architect, who tags plants at their place of growth before they are prepared for transplanting.
- C. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
 - 1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
 - 2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
- D. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk materials with appropriate certificates.
- C. Deliver bare-root stock plants within 24 hours of digging. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting. Transport in covered, temperature-controlled vehicles, and keep plants cool and protected from sun and wind at all times.
- D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- E. Handle planting stock by root ball.

- F. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.
- G. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
 - 1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.
- H. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.
- I. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
 - 1. Heel-in bare-root stock. Soak roots that are in less than moist condition in water for two hours. Reject plants with dry roots.
 - 2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 - 3. Do not remove container-grown stock from containers before time of planting.
 - 4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.10 FIELD CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.
 - b. Structural failures including plantings falling or blowing over.
 - c. Faulty performance of edgings.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Periods: From date of planting completion.
 - a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.

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- b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
- c. Annuals: Three months.
3. Include the following remedial actions as a minimum:
 - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 - c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.
 - d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
 1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots are unacceptable.
 2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- D. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.
- E. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.
- F. Annuals: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with

excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery.

2.2 FERTILIZERS

- A. Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.
1. Size: 5-gram tablets.
 2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

2.3 MULCHES

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
1. Type: Shredded hardwood or as noted by the Landscape Architect.
 2. Size Range: 3 inches maximum, 1/2 inch minimum.
 3. Color: Natural.
- B. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through a 1-inch sieve; soluble-salt content of 2 to 5 dS/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
1. Organic Matter Content: 50 to 60 percent of dry weight.
 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

2.4 WEED-CONTROL BARRIERS

- A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally encountered chemicals, alkalis, and acids.
- B. Composite Fabric: Woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, 4.8 oz./sq. yd..

2.5 PESTICIDES

- A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

- C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.6 TREE-STABILIZATION MATERIALS

A. Trunk-Stabilization Materials:

1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.
2. Wood Deadmen: Timbers measuring 8 inches in diameter and 48 inches long, treated with specified wood pressure-preservative treatment.
3. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or turnbuckles.
4. Guys and Tie Wires: ASTM A641/A641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch in diameter.
5. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.
6. Guy Cables: Five-strand, 3/16-inch-diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3 inches long, with two 3/8-inch galvanized eyebolts.
7. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.

B. Root-Ball Stabilization Materials:

1. Upright Stakes and Horizontal Hold-Down: Rough-sawn, sound, new hardwood or softwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated; stakes pointed at one end.
2. Wood Screws: ASME B18.6.1.

2.7 LANDSCAPE EDGINGS

A. Steel Edging: Standard commercial-steel edging, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Border Concepts, Inc.
 - b. Collier Metal Specialties, Inc.
 - c. Sure-loc Edging Corporation.
2. Edging Size: As indicated on drawings.
3. Stakes: Tapered steel, a minimum of 12 inches long.
4. Accessories: Standard tapered ends, corners, and splicers.
5. Finish: Unfinished.

B. Plastic Edging: Standard black polyethylene or vinyl edging, V-lipped bottom, extruded in standard lengths, with 9-inch steel angle stakes.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Oly-Ola Edgings, Inc.
 - b. Permaloc Corporation.
 - c. Sure-loc Edging Corporation.

2. Edging Size: Indicated on drawings.
3. Top Profile: Straight, with top 2 inches being 1/4 inch thick.
4. Top Profile: Round top, 1/2 inch in diameter.
5. Accessories: Manufacturer's standard alignment clips or plugs.

2.8 MISCELLANEOUS PRODUCTS

- A. Wood Pressure-Preservative Treatment: AWWPA U1, Use Category UC4a; acceptable to authorities having jurisdiction, and containing no arsenic or chromium.
- B. Root Barrier: Black, molded, modular panels 18 inches high (deep), 85 mils thick, and with vertical root deflecting ribs protruding 3/4 inch out from panel surface; manufactured with minimum 50 percent recycled polyethylene plastic with UV inhibitors.
- C. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.
- D. Burlap: Non-synthetic, biodegradable.
- E. Planter Drainage Gravel: Washed, sound crushed stone or gravel complying with ASTM D448 for Size No. 8.
- F. Planter Filter Fabric: Woven geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.
- G. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.
 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
 3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 4. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.
- D. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

3.3 PLANTING AREA ESTABLISHMENT

- A. General: Prepare planting area for soil placement and mix planting soil according to landscape architect drawings.
- B. Placing Planting Soil: [Place and mix planting soil in-place over exposed subgrade] [Place manufactured planting soil over exposed subgrade] [Blend planting soil in place] <Insert requirement>.
- C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
- D. Application of Mycorrhizal Fungi: At time directed by Architect, broadcast dry product uniformly over prepared soil at application rate indicated on Drawings.

3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits.
 1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
 2. Excavate approximately three times as wide as ball diameter for balled and burlapped stock.
 3. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
 4. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
 5. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.

6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
 7. Maintain supervision of excavations during working hours.
 8. Keep excavations covered or otherwise protected overnight.
 9. If drain tile is indicated on Drawings or required under planting areas, excavate to top of porous backfill over tile.
- B. Backfill Soil: Subsoil and topsoil removed from excavations may be used as backfill soil unless otherwise indicated.
- C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
1. Hardpan Layer: Drill 6-inch-diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.
- D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.
- E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

- A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.
1. Backfill: Planting soil. For trees, use excavated soil for backfill.
 2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
 - a. Quantity: As indicated on Drawings.
 5. Continue backfilling process. Water again after placing and tamping final layer of soil.

- D. Bare-Root Stock: Set and support each plant in center of planting pit or trench with root flare 1 inch above adjacent finish grade.
1. Backfill: Planting soil <Insert drawing designation>. [For trees, use excavated soil for backfill.]
 2. Spread roots without tangling or turning toward surface. Plumb before backfilling, and maintain plumb while working.
 3. Carefully work backfill in layers around roots by hand. Bring roots into close contact with the soil.
 4. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 5. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside soil-covered roots about 1 inch from root tips; do not place tablets in bottom of the hole or touching the roots.
 - a. Quantity: As indicated on Drawings.
 6. Continue backfilling process. Water again after placing and tamping final layer of soil.
- E. Watering Pipe: During backfilling, install watering pipe 4 feet deep into the planting pit outside the root ball as indicated on Drawings with top of pipe 1 inch above the mulched surface.
- F. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 TREE, SHRUB, AND VINE PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.
- B. Prune, thin, and shape trees, shrubs, and vines as directed by Architect.
- C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.
- D. Do not apply pruning paint to wounds.

3.7 TREE STABILIZATION

- A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated:
1. Upright Staking and Tying: Stake trees of 2- through 5-inch caliper. Stake trees of less than 2-inch caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend to the dimension indicated on Drawings above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
 2. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

- B. Trunk Stabilization by Staking and Guying: Install trunk stabilization as follows unless otherwise indicated on Drawings. Stake and guy trees more than 14 feet in height and more than 3 inches in caliper unless otherwise indicated.
1. Site-Fabricated, Staking-and-Guying Method: Install no fewer than three guys spaced equally around tree.
 - a. Securely attach guys to stakes 30 inches long, driven to grade. Adjust spacing to avoid penetrating root balls or root masses. Provide turnbuckle for each guy wire and tighten securely.
 - b. For trees more than 6 inches in caliper, anchor guys to wood deadmen buried at least 36 inches below grade. Provide turnbuckle for each guy wire and tighten securely.
 - c. Support trees with bands of flexible ties at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
 - d. Support trees with guy cable or multiple strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
 - e. Attach flags to each guy wire, 30 inches above finish grade.
 2. Proprietary Staking and Guying Device: Install staking and guying system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.
- C. Root-Ball Stabilization: Install at- or below-grade stabilization system to secure each new planting by the root ball unless otherwise indicated.
1. Wood Hold-Down Method: Place vertical stakes against side of root ball and drive them into subsoil; place horizontal wood hold-down stake across top of root ball and screw at each end to one of the vertical stakes.
 - a. Install stakes of length required to penetrate at least to the dimension indicated on Drawings below bottom of backfilled excavation. Saw stakes off at horizontal stake.
 - b. Install screws through horizontal hold-down and penetrating at least 1 inch into stakes. Pre-drill holes if necessary to prevent splitting wood.
 - c. Install second set of stakes on other side of root trunk for larger trees.
 2. Proprietary Root-Ball Stabilization Device: Install root-ball stabilization system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.

3.8 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on Drawings in even rows with triangular spacing.
- B. Use planting soil for backfill.
- C. Dig holes large enough to allow spreading of roots.
- D. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to a depth not less than two nodes.

- E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.9 PLANTING AREA MULCHING

- A. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of **[6 inches]** **[12 inches]** and secure seams with galvanized pins.
- B. Mulch backfilled surfaces of planting areas and other areas indicated.
 - 1. Trees and Treelike Shrubs in Turf Areas: Apply organic mulch ring of 2-inch average thickness, with 12-inch radius around trunks or stems. Do not place mulch within 3 inches of trunks or stems.
 - 2. Organic Mulch in Planting Areas: Apply 2-inch average thickness of organic mulch extending 12 inches beyond edge of individual planting pit or trench, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.
 - 3. Mineral Mulch in Planting Areas: Apply 2-inch average thickness of mineral mulch extending 12 inches beyond edge of individual planting pit or trench, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.

3.10 EDGING INSTALLATION

- A. Steel Edging: Install steel edging where indicated according to manufacturer's written instructions. Anchor with steel stakes spaced approximately 30 inches apart, driven below top elevation of edging.
- B. Plastic Edging: Install plastic edging where indicated according to manufacturer's written instructions. Anchor with steel stakes spaced approximately **[36 inches]** **[48 inches]** apart, driven through upper base grooves or V-lip of edging.
- C. Shovel-Cut Edging: Separate mulched areas from turf areas, curbs, and paving with a 45-degree, 4- to 6-inch-deep, shovel-cut edge as indicated on Drawings.

3.11 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.
- B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.12 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas according to manufacturer's written recommendations. Do not apply to seeded areas.
- C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.13 REPAIR AND REPLACEMENT

- A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Architect.
 - 1. Submit details of proposed pruning and repairs.
 - 2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
 - 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.
- B. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.
 - 1. Provide new trees of same size as those being replaced for each tree of 6 inches or smaller in caliper size.
 - 2. Species of Replacement Trees: Same species being replaced.

3.14 CLEANING AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.
- C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

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- D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.
- E. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

3.15 MAINTENANCE SERVICE

- A. Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:
 - 1. Maintenance Period: 12 months from date of planting completion.
- B. Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:
 - 1. Maintenance Period: Six months from date of planting completion.

END OF SECTION 329300

CONTACT INFORMATION FOR THE AWARDED CONTRACTOR ONLY.

PROJECT TITLE and PROJECT DIRECTORY

Restoration and Expansion
Historic Metlar-Bodine House
Piscataway, Middlesex County, NJ
Architects Project No.: 1836C

DOCUMENT 000101 - PROJECT TITLE and PROJECT DIRECTORY

1.1 PROJECT INFORMATION

- A. Restoration and Expansion of the Historic Metlar-Bodine House
1. Address: 1281 River Road - Piscataway, New Jersey 08854 / Phone 732-463-8363
 2. Website: www.metlarbodinehousemuseum.org
- B. Owner: Township of Piscataway
1. Owner Contact: Timothy J. Dacey, Township Administrator
 2. Address: 455 Hoes Lane, Piscataway, NJ 08854-4147
 3. Phone: 732-562-2300 / Fax: 732-529-2500
 4. Website: www.piscatawaynj.org
- C. Using Agency: Fellowship for the Metlar-House
1. Using Agency Contact: Junelynn Sadlowski, Executive Director
 2. Address: 1281 River Road - Piscataway, New Jersey 08854
 3. Phone: 732-463-8363
 4. Website: www.metlarbodinehousemuseum.org
- D. Architect: Connolly & Hickey Historical Architects, LLC
1. Principal Architect: Thomas B. Connolly, AIA, Principal Architect (Ext. 107-tom@chhistoricalarchitects.com)
 2. Address: PO Box 1726; 1 South Union Avenue, 3rd Floor, Cranford, New Jersey 07016.
 3. Phone: 973 746 4911
 4. Other Contacts: Margaret M. Hickey, AIA, Historic Preservation Specialist (Ext. 109 – margaret@chhistoricalarchitects.com); Mirek Skros, Assoc. AIA, Architectural Designer (Ext. 108 – mirek@chhistoricalarchitects.com)
 5. Website: www.chhistoricalarchitects.com
 6. Consultants:
 - a. Structural Engineer: KSI Professional Engineers; P.O. Box 628, 149 Yellowbrook Rd. Farmingdale, NJ 07727 / Phone: 732-938-2666
 - b. MEP Engineer: KSI Consulting Engineers; P.O. Box 628, 149 Yellowbrook Rd. Farmingdale, NJ 07727 / Phone: 732-938-2666
 - c. Civil Engineer: Grotto Engineering Associates; 340 North Avenue Cranford, NJ 07016 / Phone: 908.272.8901
 - d. Landscape Architect: John Morgan Thomas Landscape Architect; 4 South Union Street Suite 300, Lambertville, NJ 08530/ Phone 609.397.9070
- E. Architect Project No. 1836C
- F. Issued: 30 June 2021.

1.2 FUNDING SOURCE:

- A. Garden State Historic Preservation Trust Fund

PROJECT TITLE and PROJECT DIRECTORY

Restoration and Expansion
Historic Metlar-Bodine House
Piscataway, Middlesex County, NJ
Architects Project No.: 1836C

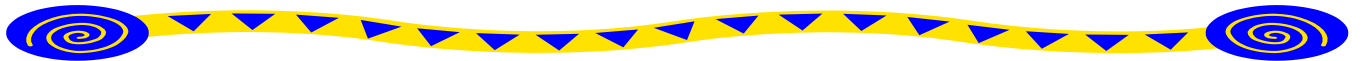
1. Agency: New Jersey Historic Trust
2. Address: PO Box 457, Trenton, New Jersey 08625-0212
3. Phone: 609-984-0473

1.3 OTHER

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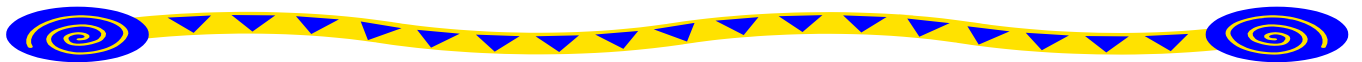
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THE TOWNSHIP OF PISCATAWAY



PLANS

Pages 1-62



MARIA E. VALENTE-CAEMMERER

Purchasing Agent/Township Secretary

RESTORATION & EXPANSION HISTORIC METLAR-BODINE HOUSE

TOWNSHIP OF PISCATAWAY, MIDDLESEX COUNTY, NEW JERSEY

BRIAN WAHLER, MAYOR

PISCATAWAY TOWNSHIP COUNCIL

KAPIL SHAH, COUNCIL PRESIDENT

MICHELE LOMBARDI, COUNCIL VICE PRESIDENT

GABRIELLE CAHILL

LINWOOD ROUSE

FRANK UHRIN

JIM BULLARD

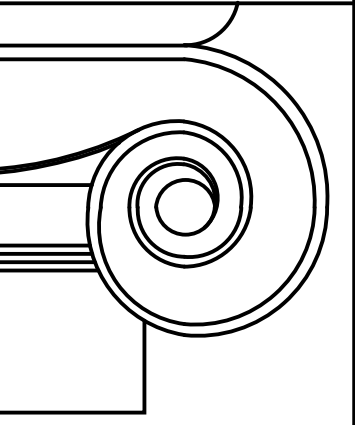
STEVEN CAHN

BUSINESS ADMINISTRATOR

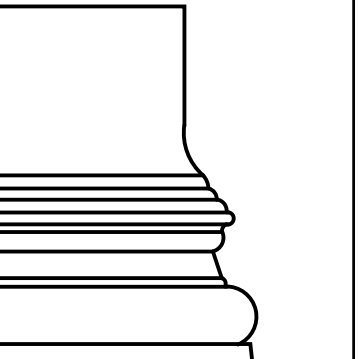
TIMOTHY DACEY

TOWNSHIP CLERK

MELISSA SEADER



CONNOLLY & HICKEY
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P.O. Box 1726
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THOMAS B. CONNOLLY, AIA
NJ 21A0169200
PA RA403776
MARGARET M. HICKEY, AIA
NJ 21A018244500

PROJECT No. : 1836C

DATE : 30 JUNE 2021

REVISIONS :

DRAWN BY : TBC, MMH, MS

RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
TOWNSHIP OF PISCATAWAY
MIDDLESEX COUNTY, NEW JERSEY

T1

PROJECT DATA

PROJECT NAME: RESTORATION AND EXPANSION METLAR-BODINE HOUSE MUSEUM

ADDRESS: 1281 RIVER ROAD PISCATAWAY, NEW JERSEY 08854

BLOCK'S NO.: 4007 **LOT NO.:** 13

OWNERSHIP: STATE OF NEW JERSEY/DEPT. OF TRANSPORTATION

AGENT OF OWNER: TIMOTHY J. DACEY, BUSINESS ADMINISTRATOR TOWNSHIP OF PISCATAWAY 455 HOES LANE, PISCATAWAY, NJ 08854 732 529 2528 (PH/ON)

USE: HOUSE MUSEUM

CONSTRUCTION TYPE: 5B COMBUSTIBLE/UNPROTECTED PROTECTED

USE GROUP: B - BUSINESS

HISTORIC REGISTER: THE METLAR-BODINE HOUSE IS LISTED ON THE NEW JERSEY AND NATIONAL REGISTERS OF HISTORIC PLACES. ALL WORK IS SUBJECT TO COMPLIANCE WITH THE SECRETARY OF THE INTERIOR'S STANDARDS FOR THE TREATMENT OF HISTORIC PROPERTIES.

SCOPE OF WORK: THE FOLLOWING DOES NOT LIST ALL WORK REQUIRED FOR A COMPLETE AND PROPER JOB. SELECTIVE DEMOLITION OF EXISTING FINISHES AND STRUCTURAL COMPONENTS; NEW WOOD FRAMED EXPANSION INCLUDING NEW CONCRETE FOUNDATIONS, NEW FRAMING AND INTERIOR/EXTERIOR FINISHES, NEW DOORS AND WINDOWS, NEW CONCRETE FLOORS, NEW CATERING KITCHEN AND ASSOCIATED PLUMBING, NEW INTERIOR AND EXTERIOR LIGHTING, NEW ASPHALT SHINGLE ROOFING, NEW TPO MEMBRANE ROOFING, NEW GUTTERS, LEADERS, CAST IRON LEADER SLEEVES AND ASSOCIATED UNDERGROUND DRAINAGE, NEW EXTERIOR STEEPLING INCLUDING MASONRY RETAINING WALLS, WALKS AND PATIOS, INTERIOR AND EXTERIOR PRIMING AND 2 COAT FINISH PAINTING.

BID ALTERNATE - EXTERIOR RESTORATION OF THE METLAR-BODINE HOUSE INCLUDING SURFACE PREPARATION AND PAINTING OF EXTERIOR FINISHES.

SITE DIAGRAM IS PROVIDED FOR INFORMATIONAL PURPOSES ONLY.

GENERAL NOTES

THESE DRAWINGS AS INSTRUMENTS OF SERVICE, ARE AND SHALL REMAIN THE SOLE PROPERTY OF THE ARCHITECT. THEY ARE INTENDED ONLY FOR USE BY THE OWNER AND ONLY ON THIS COMMISSIONED PROJECT. ANY UNAUTHORIZED USE, REPRODUCTION OR COPY OF ANY PART OF THESE DRAWINGS WITHOUT THE APPROVAL OF THE ARCHITECT IS PROHIBITED.

ALL CONTRACTORS AND SUBCONTRACTORS SHALL INSPECT THE CONDITIONS UNDER WHICH THE WORK IS TO BE PERFORMED AND NOTIFY THE ARCHITECT IMMEDIATELY OF ANY UNSATISFACTORY CONDITIONS. PROCEEDING WITH THE WORK WITHOUT NOTIFYING THE ARCHITECT SHALL MAKE THE CONTRACTOR OR SUBCONTRACTOR LIABLE FOR FAULTY WORKMANSHIP.

ALL CONTRACTORS AND SUBCONTRACTORS SHALL FIELD VERIFY ALL DIMENSIONS SHOWN ON THE DRAWINGS AND NOTIFY THE ARCHITECT IMMEDIATELY OF ANY DISCREPANCIES. DO NOT SCALE THE DRAWINGS. ALL FIELD VERIFIED DIMENSIONS SHALL GOVERN THE WORK.

ALL CONTRACTORS AND SUBCONTRACTORS, PRIOR TO COMMENCING THE WORK, SHALL FURNISH TO THE OWNER CERTIFICATES OF INSURANCE. ALL WORK SHALL BE FULLY BONDED AND WARRANTIES PROVIDED.

ALL MATERIAL AND LABOR SHALL BE GUARANTEED FOR A PERIOD OF ONE YEAR FROM THE DATE OF FINAL PAYMENT BY THE OWNER.

ALL CONTRACTORS AND SUBCONTRACTORS, PRIOR TO COMMENCING THE WORK, SHALL OBTAIN ALL REQUIRED PERMITS FROM THE GOVERNMENTAL AGENCIES HAVING JURISDICTION OVER THE WORK. PURSUANT TO THE STATE UNIFORM CONSTRUCTION ACT, THE OWNER IS A TAX EXEMPT ORGANIZATION, AND MAY NOT BE CHARGED ANY LOCAL, STATE, OR FEDERAL TAXES.

ALL WORK SHALL BE PERFORMED IN THE BEST WORKMANLIKE MANNER.

EACH CONTRACTOR AND SUBCONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL, CARTING AND DISPOSAL OF ALL DEBRIS FROM THE SITE. LEAVE THE PREMISES CLEAN, NEAT AND ORDERLY UPON ENDING EACH DAY'S WORK AND UPON FINAL COMPLETION OF THE WORK. PROVIDE THE OWNER WITH A CERTIFIED STATEMENT THAT ALL MATERIALS HAVE BEEN PROPERLY DISPOSED OF AND ALL PERTINENT LAWS AND REGULATIONS OF GOVERNMENTAL AGENCIES HAVING JURISDICTION OVER THE WORK HAVE BEEN FULLY COMPLIED WITH.

ALL WORK SHALL BE PERFORMED TO ALL STATE AND LOCAL REQUIREMENTS, INCLUDING BUT NOT LIMITED TO THE FOLLOWING:

- BUILDING SUBCODE (NJAC 5:23);
- INTERNATIONAL BUILDING CODE/2018, NJ ed.
- NJAC 5:23-6 REHABILITATION SUBCODE (NJAC 5:23-6) --- "RECONSTRUCTION"
- NJAC 5:23-7 BARRIER-FREE SUBCODE AND ICC/ANSI A117.1-2009 (CHAPTER 11 OF IBC/2018 & NJAC 5:23-7)
- NATIONAL ELECTRICAL CODE (NFPA 70)/2017 (NJAC 5:23-3.16)
- NATIONAL STANDARD PLUMBING CODE/2018 (NJAC 5:23-3.15)
- INTERNATIONAL MECHANICAL CODE/2018 (NJAC 5:23-3.20)
- INTERNATIONAL FUEL GAS CODE/2018, (NJAC 5:23-3.22)
- ASHRAE 90.1-2016 (NJAC 5:23-3.18)

ALL SUBCONTRACTORS SHALL FURNISH ALL LABOR, TOOLS, EQUIPMENT, MATERIAL AND SUPERVISION FOR ITS PORTION OF THE WORK.

ALL SUBCONTRACTORS' FEES SHALL INCLUDE SUPERVISION OF THE SUBCONTRACTOR'S EMPLOYEES.

THE CONTRACTOR IS EXCLUSIVELY RESPONSIBLE FOR LOSS OR EXPENSE RESULTING FROM INJURY ON THE PROJECT SITE.

THE CONTRACTOR ASSUMES ALL RISKS IN THE PERFORMANCE OF THE WORK.

THE CONTRACTOR IS RESPONSIBLE FOR SUPERVISION, SAFETY, ADMINISTRATION AND ALL PHASES OF ITS CONTRACT.

THE CONTRACTOR IS RESPONSIBLE FOR SCHEDULING, COORDINATION, MANAGEMENT AND ADMINISTRATION OF SUBCONTRACTS.

THE CONTRACTOR SHALL MEET THE LATEST REQUIREMENTS OF THE UNITED STATES DEPARTMENT OF LABOR OCCUPATIONAL SAFETY AND HEALTH STANDARDS AND COMPLY WITH THE MANUAL OF ACCIDENT PREVENTION IN CONSTRUCTION; ALL APPLICABLE SAFETY AND SANITARY LAWS, REGULATIONS AND ORDINANCES; AND ANY SAFETY RULES OR PROCEDURES ESTABLISHED BY THE OWNER OF THE PROJECT OR ANY GOVERNMENTAL AGENCIES HAVING JURISDICTION OVER THE WORK.

THE CONTRACTOR SHALL PROTECT ALL PERSONS NEAR OR ON THE PREMISES FROM UNREASONABLE RISKS OF INJURY.

THE CONTRACTOR SHALL PROVIDE WARNING SIGNS AND LIGHTS, BARRICADES, RAILINGS AND OTHER SAFEGUARDS.

IN ADDITION TO NAMING THE OWNER AS ADDITIONALLY INSURED, THE CONTRACTOR SHALL ALSO NAME THE ARCHITECT AS ADDITIONALLY INSURED FOR THIS PROJECT.

THE ARCHITECT'S OBSERVATION FOR COMPLIANCE WITH THE DRAWINGS AND SPECIFICATIONS SHALL NOT BE DEEMED AS SUPERVISION OR CONTROL OF CONSTRUCTION MEANS OR METHODS EMPLOYED BY THE CONTRACTOR OR ANY OF HIS SUBCONTRACTORS.

LIST OF DRAWINGS

| | |
|-------|--|
| COVER | PROJECT DATA, GENERAL NOTES, LIST OF DRAWINGS, BID ALTERNATES, REVISIONS, LOCATION MAP, SITE DIAGRAM, SITE NOTES |
| T1 | TITLE SHEET |
| CS1 | SITE LOCATION MAP, LIST OF DRAWINGS, REVISIONS, BID ALTERNATES, PROJECT DATA, GENERAL NOTES |
| C1 | INDEX OF UTILITIES, KEY MAP, SURVEY REFERENCES, GENERAL INFORMATION/NOTES, INDEX OF SHEETS |
| C2 | EXISTING CONDITION AND DEMOLITION PLAN, GENERAL NOTES, SURVEY NOTES |
| C3 | SITE PLAN |
| C4 | GRADING AND UTILITY PLAN |
| C5 | SOIL EROSION AND SEDIMENT CONTROL PLAN |
| C6 | SOIL EROSION SEDIMENT CONTROL DETAILS-1 |
| C7 | SOIL EROSION SEDIMENT CONTROL DETAILS-2 |
| C8 | CONSTRUCTION DETAILS 1 |
| C9 | EX MH 1 TO STORM INLET 10, EX MH 2 TO STORM INLET 3, LATERAL PROFILE |
| SP1 | SITE DIAGRAM, STONE RETAINING WALL DETAIL, FOOT BRIDGE PLAN, FOOT BRIDGE SECTION, FOOT BRIDGE EDGE DETAIL, STONE RETAINING WALL FENCE DETAIL |
| SP2 | ACCESSIBLE PARKING/ACCESSIBLE ROUTE, WHEEL STOP DETAIL, POST ANCHOR DETAIL, CONCRETE STAIR SECTION, PAVER EDGE DETAIL, EXPANSION JOINT DETAIL, CONCRETE WALK/PAD DETAIL, CONCRETE STAIR DETAIL, BARRIER FREE ROUTE SIGN DETAIL, ACCESSIBLE LANDING DETAIL, PAVER SETTING DETAIL, ACCESSIBLE PARKING SIGN DETAIL, TYPICAL HAND RAIL |
| L1 | PLANTING PLAN |
| L2 | PLANTING SPECIFICATION, PLANT SCHEDULE |
| L3 | CORTEN STEEL WALL (36" MAX HEIGHT), CORTEN STEEL WALL WITH FACSIMILE STONE ROAD PLAN, CORTEN STEEL WALL (18" MAX HEIGHT), TAR AND CHIP PATH |
| A1 | BASEMENT PLAN, FIRST FLOOR PLAN |
| A2 | SECOND FLOOR PLAN, ROOF PLAN |
| A3 | SOUTH ELEVATION, WEST ELEVATION |
| A4 | NORTH ELEVATION, EAST ELEVATION |
| A5 | ENLARGED FOUNDATION PLAN |
| A6 | ENLARGED FIRST FLOOR PLAN @ ADDITION, PLAN LEGEND |
| A7 | ENLARGED ROOF PLAN@ADDITION, FLASHING@TYPICAL PIPE PENETRATION, CAST-IRON LEADER SLEEVE, ROOFING NOTES |
| A8 | BUILDING SECTION THROUGH KITCHEN/GALLERY, BUILDING SECTION THRU KITCHEN |
| A9 | BUILDING SECTION THRU CORRIDOR / GALLERY, BUILDING SECTION THRU CORRIDOR |
| A10 | TYPICAL WALL SECTION AT GALLERY COLUMNS, TYPICAL WALL SECTION |
| A11 | TYPICAL EAVE DETAIL AT LOWER GABLE, TYPICAL EAVE DETAIL AT GALLERY, TYPICAL RIDGE DETAIL, DRIP EDGE DETAIL, CORNER BOARD DETAIL, BOARD TRIM DETAIL |
| A12 | TYPICAL EAVE DETAIL AT LOWER GABLE, TYPICAL EAVE DETAIL AT LOWER GABLE, ROOF MEMBRANE SYSTEM, BASE WALL FLASHING DETAIL, DRIP EDGE DETAIL AT FLAT ROOF, L-METAL JOINT DETAIL |
| A13 | STEPPED FLASHING AT WOOD FRAMED WALL, CORNICE EAVE RETURN, GABLE-END TRUSS, RAKE FLASHING, TYPICAL SOFFIT, TYPICAL UNRATED BEARING/NON-BEARING PARTITION, SECTION AT DROP-DOWN STAIR, CORNER DETAIL AT FIXED PANELS, DOOR JAMB AT FIXED PANEL DETAIL, MULLION DETAIL AT FIXED PANEL, FIXED PANEL WALL DETAIL |
| A14 | ROOM SIGN PLACEMENT REQUIREMENTS, TYPICAL MOUNTING HEIGHTS, FLOOR DRAIN DETAIL, MAXIMUM OCCUPANCY SIGN, PICTOGRAM ROOM SIGN, ROOM SIGN ON DOOR, WOOD FENCE DETAIL, INTERIOR WORK NOTES & KEY, FINISH SCHEDULE |
| A15 | VESTIBULE INTERIOR ELEVATIONS, CORRIDOR INTERIOR ELEVATIONS |
| A16 | GALLERY INTERIOR ELEVATIONS |
| A17 | GALLERY INTERIOR ELEVATIONS |
| A18 | GALLERY INTERIOR ELEVATIONS, KITCHEN INTERIOR ELEVATIONS |
| A19 | DOOR TYPES, DOOR SCHEDULE |
| A20 | METAL THRESHOLD, EXTERIOR DOOR BUCK@GALLERY, INTERIOR DOOR BUCK@CORRIDOR, DOOR HARDWARE SCHEDULE |
| A21 | WINDOW TYPES, WINDOW DRIP CAP FLASHING DETAIL, WINDOW W106 ELEVATION, SECTION @W106, WINDOW SCHEDULE |
| A22 | SOUTH ELEVATION, WEST ELEVATION, FINISH CARPENTRY REPAIR NOTES |
| A23 | NORTH ELEVATION, EAST ELEVATION, EAST PORCH BALUSTER DETAIL |
| A24 | SHUTTER DETAILS, SHUTTER REPAIR SCHEDULE |
| A25 | PORCH COLUMN BASE DETAIL, WOOD DUTCHMAN REPAIR, SILL REPAIR DETAIL, GLAZING PUTTY DETAIL, EPOXY REPAIR DETAIL, WOOD EPOXY DETAIL, SURFACE PREPARATION DETAIL, FINISH CARPENTRY REPAIR NOTES |
| S0.1 | GOVERNING CODE 2018 INTERNATIONAL BUILDING CODE, GENERAL NOTES, FOUNDATION, MASONRY NOTES, STRUCTURAL STEEL, CAST-IN-PLACE CONCRETE, WOOD CONSTRUCTION, PREFAB WOOD TRUSSES |
| S1.1 | FOUNDATION PLAN, COLUMN SCHEDULE, FOOTING SCHEDULE, PIER SCHEDULE |
| S1.2 | ROOF FRAMING PLAN, COLUMN SCHEDULE, HEADER SCHEDULE, POST SCHEDULE, BEAM SCHEDULE, WOOD TRUSS LOADING |

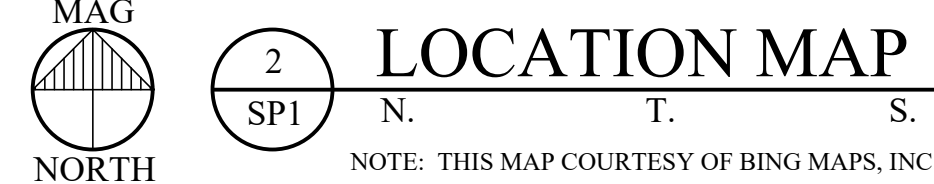
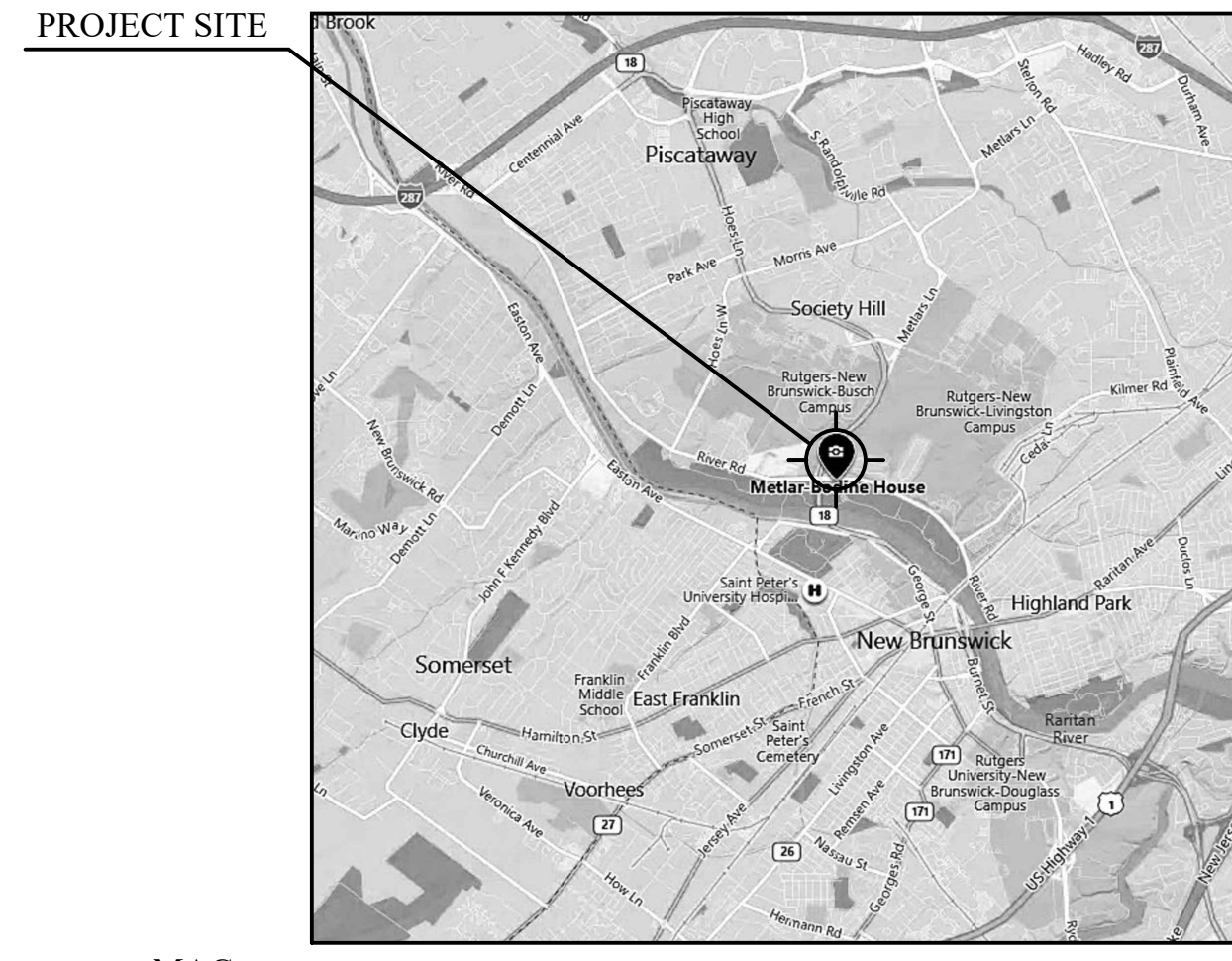
| | |
|-------|---|
| S2.1 | DETAIL AT EXTERIOR WALL, DETAIL AT NEW TO EXIST FDN, DETAIL AT DOOR/STOREFRONT ABOVE, DETAIL AT EXTERIOR STEEL COLUMN DETAIL AT INTERIOR COLUMN FOOTING, DETAIL AT NEW TO EXIST SLAB, DETAIL AT FOUNDATION WALL SHIFT, DETAIL AT STOREFRONT, ANCHOR ROAD DETAIL, TYPICAL FOOTING STEP, TYPICAL CONTROL JOINT, DETAIL AT HORIZONTAL REINFORCEMENT IN BOND BEAMS, COLUMN ISOLATION JOINT DETAIL, TYPICAL CONSTRUCTION JOINT, TYPICAL PIPE PENETRATION THROUGH MASONRY FOUNDATION WALL |
| S3.1 | DETAIL AT TRUSS TOP CHORD, DETAIL AT ROOF BEAM TO TRUSS CONN, DETAIL AT ROOF BM TO TRUSS CONNX, DETAIL AT ROOF EAVE, DETAIL AT TRUSS TO COLUMN CONNX, PLAN DETAIL, DETAIL AT ROOF TRANSITION, DETAIL AT TRUSS TO COL CONNX, STEEL TRUSS MEMBER DETAILS, TRUSS PROFILE T-1, TRUSS PROFILE T-2(GABLE END), TRUSS PROFILE T-3, TRUSS PROFILE T-4 |
| M0.1 | PROJECT GENERAL NOTES, MECHANICAL SYMBOLS, SYMBOL LIST, GENERAL ABBREVIATION, MECHANICAL ABBREVIATION, GENERAL NOTES (APPLY TO ALL DRAWINGS), HVAC DESIGN CRITERIA |
| M1.1 | MECHANICAL FIRST FLOOR PART PLA, KEY NOTES, GENERAL NOTES, FIRST FLOOR KEY PLAN |
| M1.2 | MECHANICAL ATTIC PART PLAN, KEY NOTES, GENERAL NOTES, SECOND FLOOR KEY PLAN |
| M2.1 | DUCTWORK DETAILS, AIR COOLED CONDENSING UNIT DETAIL, PIPE HANGER DETAIL, TYPICAL NATURAL GAS EQUIPMENT CONNECTION, TYPICAL GAS-FIRED FURNACE W/DX COOLING COIL SPLIT SYSTEM INSTALLATION SCHEMATIC, ACOUSTICAL TREATMENT-DUCT LINING DETAIL |
| M2.2 | DUCT HANGER DETAILS, FLEXIBLE DUCT INSTALLATION, PIPE SUPPORT DETAIL, CONDENSATE DRAIN TRAP DETAIL, INLINE EXHAUST FAN DETAIL, PIPE PENETRATION THROUGH WALL, COMBINATION FLUE/COMBUSTION AIR INSTALLATION THRU ROOF DETAIL, AIR LOUVER INSTALLATION DETAIL |
| M3.1 | MECHANICAL EQUIPMENT SCHEDULE, MECHANICAL VENTILATION SCHEDULE |
| P0.1 | TYPICAL HANGER DETAIL, TYPICAL FLOOR CLEANOUT DETAIL, TYPICAL FLOOR DRAIN DETAIL, GREASE INTERCEPTOR DETAIL, PLUMBING FIXTURE SCHEDULE, PLUMBING GENERAL NOTE, PLUMBING SYMBOLS, PLUMBING ABBREVIATIONS |
| P1.1 | PLUMBING FIRST FLOOR PART PLAN, WATER HEATER INSTALLATION, KEY NOTES, GENERAL NOTES, FIRST FLOOR KEY PLAN |
| P2.1 | SANITARY RISER DIAGRAMS, GAS RISER DIAGRAMS |
| E0.1 | ELECTRICAL GENERAL NOTES, ELECTRICAL SYMBOL LEGEND, ELECTRICAL LIGHTING SCHEDULE, ELECTRICAL ABBREVIATION LEGEND, EMERGENCY LIGHTING WIRING DIAGRAM |
| SU1.1 | ELECTRICAL SITE PLAN, LIGHTING CONTROL PANEL SYMBOL, KEY NOTES, GENERAL NOTES |
| E1.1 | ELECTRICAL FIRST FLOOR PART PLAN, ELECTRICAL DEMOLITION FLOOR PART PLAN, KEY NOTES, GENERAL NOTES, FIRST FLOOR KEY PLAN |
| E1.2 | ELECTRICAL BASEMENT POWER PART PLAN, ELECTRICAL FIRST FLOOR POWER PART PLAN, ELECTRICAL DEMOLITION FIRST FLOOR PART PLAN, KEY NOTES, GENERAL NOTES, BASEMENT KEY PLAN, FIRST FLOOR KEY PLAN |
| E2.1 | ELECTRICAL PANEL SCHEDULE, FIRE ALARM RISER, TYPICAL GROUNDING SYSTEM FROM SERVICE ENTRANCE, ELECTRICAL RISER DIAGRAM, EMERGENCY LIGHTING WIRING DIAGRAM TYPICAL LIGHTING AND CONVENIENCE POWER T HVAC EQUIPMENT, SECONDARY DUCT BANK DETAIL |
| X1 | SITE LIGHTING PLAN |
| X2 | FIRST FLOOR LIGHTING PLAN |

REVISIONS

| No. | DATE | REMARKS |
|-----|------|---------|
| | | |
| | | |
| | | |
| | | |

BID ALTERNATES

| No. | DESCRIPTION |
|-----|---|
| 1 | DEDUCT RESTORATION/REPAIR AND PAINTING AT THE HISTORIC CORE (EXISTING BUILDINGS) OF THE METLAR-BODINE HOUSE |
| 2 | DEDUCT THE "FOOT BRIDGE" AND REPLACEMENT OF SIDE PORCH BALUSTERS |
| 3 | DEDUCT THE INSTALLATION OF KITCHEN EQUIPMENT |



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PROJECT No. : 1836C
DATE : 30 JUNE 2021

REVISIONS :

DRAWN BY : TBC, MMH, MS

RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
TOWNSHIP OF PISCATAWAY
MIDDLESEX COUNTY, NEW JERSEY

CS1

PRELIMINARY AND FINAL SITE PLAN

METLAR BODINE HOUSE

BLOCK 12502 LOT 10.05

SITUATED IN

TOWNSHIP OF PISCATAWAY, MIDDLESEX COUNTY, NEW JERSEY

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KAPIL K. SHAH
JAMES BILLIARD
STEVEN D. CAHN
MICHELE LOMBARDI
CHANELLE C. MCCULLUM
FRANK UHRIN

COUNCIL PRESIDENT
COUNCIL VICE PRESIDENT
COUNCILMAN
COUNCILMAN
COUNCILWOMAN
COUNCILWOMAN
COUNCILMAN

BUSINESS ADMINISTRATOR

TIMOTHY DACEY

MUNICIPAL CLERK

MELISSA A. SEADER, RMC, CMR

SUPERVISOR OF ENGINEERING

JOSEPH HERRERA, CFM

DIRECTOR OF PUBLIC WORKS

GUY GASPARI, P.E., P.L.S., P.P., CPWM

MUNICIPAL ENGINEER

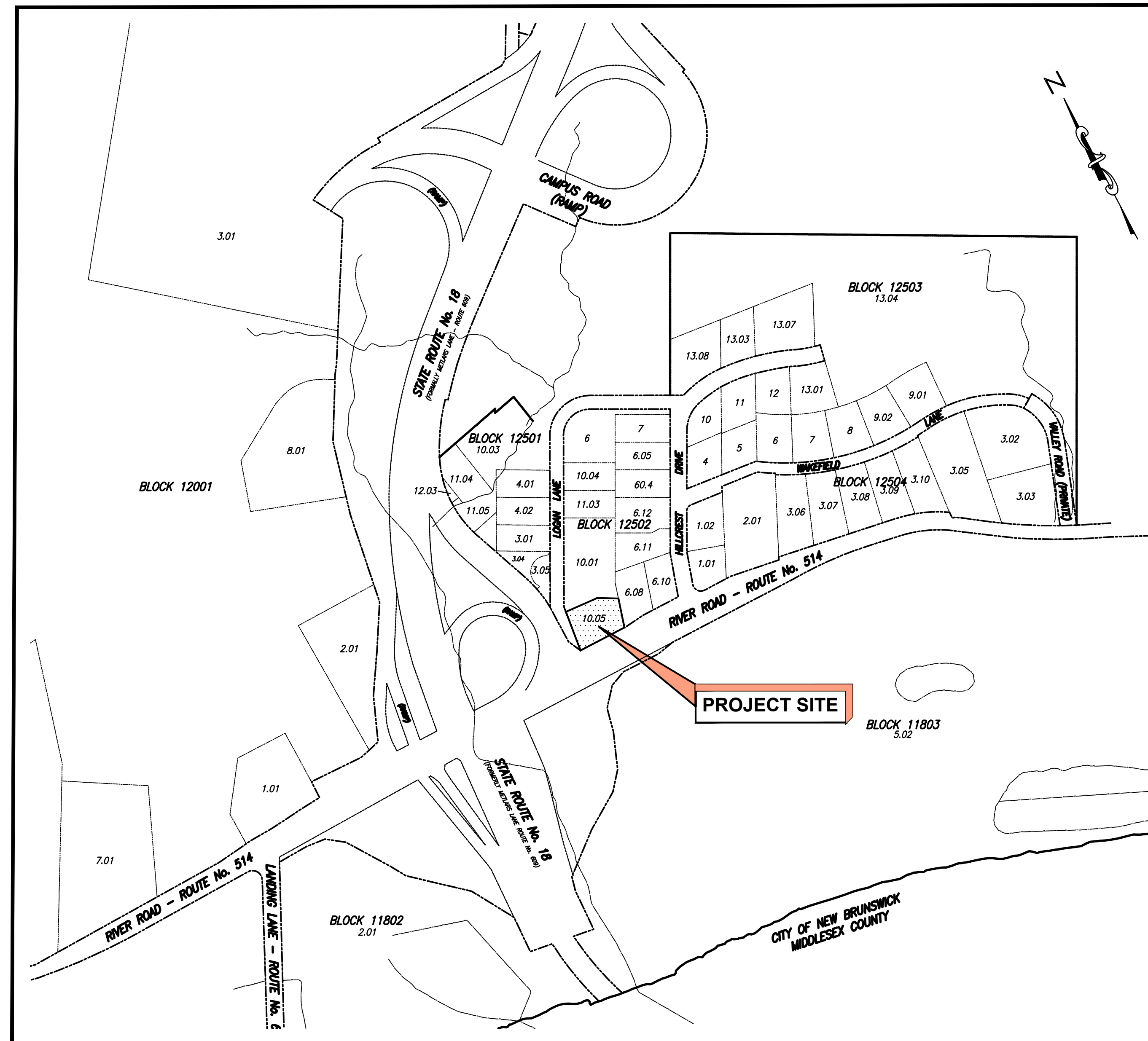
CHARLES CARLEY, P.E., P.P., C.M.E.

PROJECT ARCHITECT

THOMAS B. CONNOLLY, A.I.A. & MARGARET M. HICKEY, A.I.A.

PROJECT DESCRIPTION

THE PROPOSED PROJECT INCLUDES THE CONSTRUCTION OF TWO RETAINING WALLS, THE EXPANSION AND PARTIAL RECONSTRUCTION OF A DRIVEWAY WITH PARKING, SIDEWALKS, WALKWAYS, PATIO, SERVICE YARD, STAIRS, AND SIMILAR APPURTENANCES TO FACILITATE THE CONSTRUCTION OF A NEW BUILDING ADDITION ON THE WEST WING OF THE EXISTING STRUCTURE.



KEY MAP
SCALE: 1"=300'

SURVEY REFERENCES:

- DEED BOOK 3033 - PAGE 318 (PARCELS 24 & 24B PREVIOUSLY ACQUIRED).
- TAX MAP OF THE CITY OF THE TOWNSHIP OF PISCATAWAY, MIDDLESEX COUNTY, NEW JERSEY, SHEET No. 125.
- NEW JERSEY DEPARTMENT OF TRANSPORTATION "GENERAL PROPERTY PARCEL MAP, ROUTE 18 EXTENSION, SECTION 2 FROM JOHN A LINCX SR. BRIDGE TO HOES LANE" SHEET No. 30 OF 70, OCTOBER 1999.
- NEW JERSEY DEPARTMENT OF TRANSPORTATION ROUTE 18 EXTENSION, SECTION 2A... CONSTRUCTION DRAINAGE & UTILITY PLANS, CONTRACT No. 043960223, DATED 25 FEBRUARY, 2002.
- TOWNSHIP OF PISCATAWAY DEPARTMENT OF COMMUNICATION DEVELOPMENT DIVISION OF ENGINEERING... APPROVED SITE DIAGRAM DATED 6/27/2014.

REVISIONS

| DATE | DESCRIPTION |
|-----------|-----------------|
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| 6-30-2021 | ISSUED FOR BID. |

THE OWNER AND CONTRACTOR SHALL HOLD HARMLESS THE ENGINEER FROM AND AGAINST ALL CLAIMS, DAMAGES, LOSSES AND EXPENSES INCLUDING ATTORNEY'S FEES ARISING OUT OF OR RESULTING FROM THE PERFORMANCE OF THE WORK BY THE CONTRACTOR. CHANGES TO THE PLANS BY THE OWNER AND THE CONTRACTOR SHALL BE THE RESPONSIBILITY OF THE PERSONS MAKING SUCH CHANGES. THE CONTRACTOR SHALL CHECK AND VERIFY ALL PLAN DIMENSIONS AND CONDITIONS BEFORE PROCEEDING WITH CONSTRUCTION.

GENERAL INFORMATION/NOTES

- PROPERTY REFERENCE: BLOCK 12502, LOT 10.05, TAX MAP SHEET 125
- ALL CURB RAMPS MUST CONFORM TO THE ADA REQUIREMENTS AND THE DETAILS PROVIDED HEREIN. CURB RAMPS SHALL BE CONSTRUCTED AT ALL LOCATIONS AS SHOWN IN THE CONSTRUCTION PLANS AND/OR AS DIRECTED IN THE FIELD BY THE ENGINEER FOR CONFORMANCE WITH APPLICABLE REGULATIONS.
- THIS SET OF DRAWINGS AND ALL INFORMATION CONTAINED HEREIN IS AUTHORIZED FOR USE ONLY BY THE PARTY FOR WHOM THE WORK WAS CONTRACTED OR TO WHOM IT IS CERTIFIED.
- THIS DRAWING MAY NOT BE COPIED, REUSED, DISCLOSED, DISTRIBUTED OR RELIED UPON FOR ANY OTHER PURPOSE WITHOUT APPROVAL OF GROTTO ENGINEERING ASSOCIATES L.L.C. AND THE TOWNSHIP OF PISCATAWAY.
- CONTRACTOR SHALL PROVIDE TRAFFIC CONTROL MEASURES IN ACCORDANCE WITH THE LATEST EDITION OF THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES AND THESE PLANS AS CONTAINED HEREIN.
- WHERE NEW WORK MEETS EXISTING PAVEMENT, EXISTING PAVEMENT SHALL BE SAW CUT IN NEAT AND CLEAN LINES.
- WHERE NEW CONCRETE PIPE IS CONSTRUCTED, CONTRACTOR SHALL USE PIPE WITH GASKETED JOINTS.
- WHERE NEW PVC PIPE IS CONSTRUCTED, IT SHALL BE SDR-35 UNLESS OTHERWISE SPECIFIED.
- PROPOSED WORK SHALL COMPLY WITH THE CURRENT STANDARD SPECIFICATIONS AND DETAILS FOR ROAD AND BRIDGE CONSTRUCTION OF THE NJDOT, 2019 EDITION, UNLESS OTHERWISE SPECIFIED HEREIN. SAME ARE INCLUDED BY THIS REFERENCE.

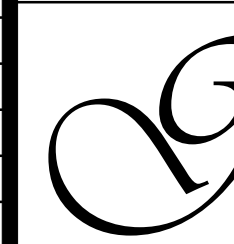
INDEX OF SHEETS

| SHEET No. | TITLE |
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| 2 | EXISTING CONDITIONS AND DEMOLITION PLAN |
| 3 | SITE PLAN |
| 4 | GRADING AND UTILITY PLAN |
| 5 | SOIL EROSION AND SEDIMENT CONTROL PLAN |
| 6 | SOIL EROSION AND CONSTRUCTION DETAILS - 1 |
| 7 | SOIL EROSION AND CONSTRUCTION DETAILS - 2 |
| 8 | CONSTRUCTION DETAILS - 1 |
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COVER SHEET

METLAR-BODINE HOUSE
BLOCK 12502 LOT 10.05

SITUATED IN
THE TOWNSHIP OF PISCATAWAY
MIDDLESEX COUNTY, NEW JERSEY



GROTTO ENGINEERING ASSOCIATES, LLC

ENGINEERS - PLANNERS - SURVEYORS

Certificate of Authorization No. 240A27918300

340 NORTH AVENUE
CRANFORD, NEW JERSEY 07016
908-272-8901 (F) 908-272-8902

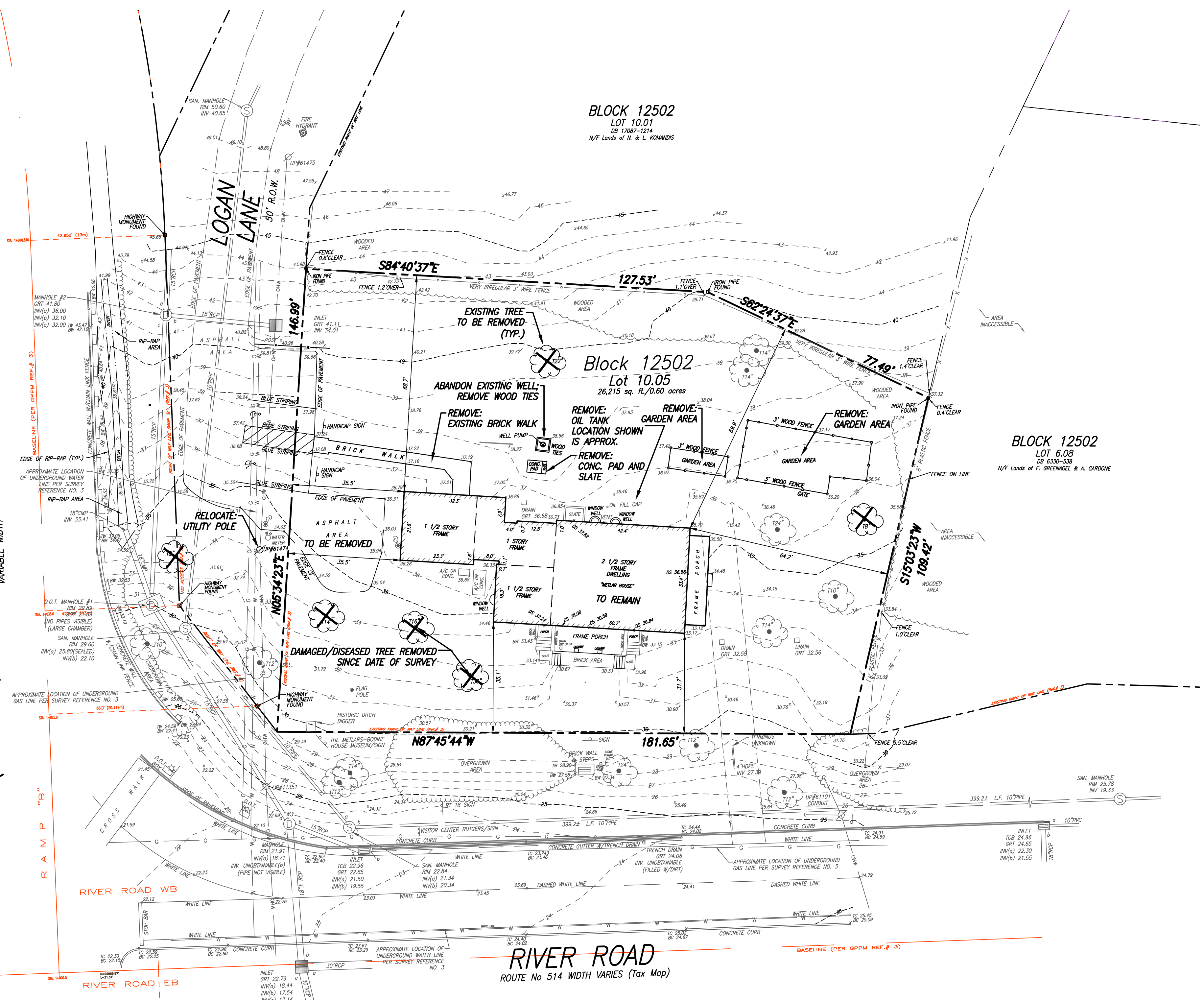
FRANK W. FARRELL

PROFESSIONAL ENGINEER
N.J. LICENSE NO. 51556

DATE: 06-30-2021 SCALE: AS SHOWN DRAWN: AJC CHECKED: FF SHEET: 1 OF 9 JOB: PR-0234

S:\Grotto Projects\PR-0234 - Metlar-Bodine House (Company & History)\Sheets\Metlar-Bodine Site Plan C 6-30-2021.dwg 6/29/2021

STATE ROUTE 18
 (Formerly Metlars Lane - Route 609)
 VARIABLE WIDTH

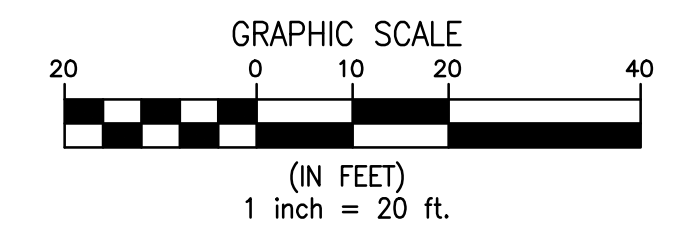


GENERAL NOTES

1. THE CONTRACTOR SHALL NOTIFY THE UNDERSIGNED PROFESSIONAL IMMEDIATELY IF ANY FIELD CONDITIONS ENCOUNTERED DIFFER FROM THOSE REPRESENTED HEREON AND/OR IF IN THE OPINION OF THE CONTRACTOR SUCH CONDITIONS SHOULD RENDER THE DESIGNS SHOWN HEREON INAPPROPRIATE OR INEFFECTIVE.
2. THE CONTRACTOR IS TO CONTACT THE "CALL BEFORE YOU DIG" TOLL FREE NUMBER AT 1-800-272-1000 THREE (3) BUSINESS DAYS BUT NO MORE THAN TEN (10) BUSINESS DAYS PRIOR TO THE START OF CONSTRUCTION. THE CONTRACTOR SHALL IMMEDIATELY REPORT ANY DAMAGE CAUSED OR DISCOVERED DURING CONSTRUCTION TO THE APPROPRIATE UTILITY AGENCY.
3. ALL UTILITIES WILL BE INSTALLED UNDERGROUND.
4. ALL MATERIALS, WORKMANSHIP AND CONSTRUCTION FOR SITE IMPROVEMENTS SHOWN HEREON SHALL BE IN ACCORDANCE WITH THE FOLLOWING:
 - A. CURRENT PREVAILING MUNICIPAL AND/OR COUNTY SPECIFICATIONS, STANDARDS, AND REQUIREMENTS.
 - B. CURRENT PREVAILING UTILITY COMPANY SPECIFICATIONS, STANDARDS, AND REQUIREMENTS.
 - C. STATE OF NEW JERSEY B.O.C.A. CODE AND BARRIER-FREE DESIGN REGULATIONS AS CURRENTLY AMENDED. BARRIER-FREE FACILITIES, INCLUDING PARKING SPACES AND RAMPS, SHALL BE PROVIDED AS REQUIRED BY THE AMERICANS WITH DISABILITIES ACT OF 1991.
 - D. CURRENT STANDARD SPECIFICATIONS AND DETAILS FOR ROAD AND BRIDGE CONSTRUCTION OF THE NJDOT, 2019 EDITION, UNLESS OTHERWISE SPECIFIED HEREIN.
5. DO NOT SCALE DRAWINGS ADJACENT AND SURROUNDING PHYSICAL CONDITIONS, BUILDINGS, STRUCTURES, ETC. ARE SCHEMATIC ONLY, EXCEPT WHERE DIMENSIONS ARE SHOWN THERETO.
6. THIS IS A SITE PLAN AND UNLESS SPECIFICALLY NOTED ELSEWHERE HEREON IS NOT A SURVEY.
7. THIS SET OF PLANS HAS BEEN PREPARED FOR PURPOSES OF MUNICIPAL AND AGENCY REVIEW AND APPROVAL AND SHALL NOT BE UTILIZED AS A CONSTRUCTION DOCUMENT UNTIL ALL CONDITIONS OF APPROVAL HAVE BEEN SATISFIED ON THE DRAWINGS AND EACH DRAWING HAS BEEN REVISED TO INDICATE "ISSUED FOR CONSTRUCTION".
8. EXISTING UTILITY INFORMATION SHOWN HEREON HAS BEEN COLLECTED FROM VARIOUS SOURCES AND IS NOT GUARANTEED AS TO ACCURACY OR COMPLETENESS. THE CONTRACTOR SHALL FIELD VERIFY ALL INFORMATION TO HIS SATISFACTION PRIOR TO EXCAVATION. WHERE EXISTING UTILITIES ARE TO BE CROSSED BY PROPOSED CONSTRUCTION, TEST PITS SHALL BE DUG BY THE CONTRACTOR PRIOR TO CONSTRUCTION TO ASCERTAIN EXISTING INVERTS, MATERIALS AND SIZES. TEST PIT INFORMATION SHALL BE GIVEN TO THE ENGINEER PRIOR TO CONSTRUCTION TO PERMIT ADJUSTMENTS AS MAY BE REQUIRED TO AVOID CONFLICTS.
9. DISTURBED AREAS TO BE RESTORED TO SATISFACTION OF THE TOWNSHIP ENGINEER.
10. ALL MISCELLANEOUS DEBRIS, INCLUDING BUT NOT LIMITED TO CONCRETE STEPS, PORCHES, GARAGES, FOOTINGS, DWELING FRAMES, OIL TANKS, CONCRETE AND ASPHALT WALKS, FENCES, ETC. SHALL BE REMOVED AND DISPOSED OF BY THE CONTRACTOR.

SURVEY NOTES

1. BOUNDARY AND TOPOGRAPHIC INFORMATION TAKEN FROM A SURVEY ENTITLED "BOUNDARY & TOPOGRAPHIC SURVEY, FOR 1281 RIVER ROAD, BLOCK 12502, LOT 10.05, TOWNSHIP OF PISCATAWAY, NEW JERSEY, PREPARED BY CONTROL LAYOUTS, INC., GREGG A. GAFFNEY, N.J., P.L.S., LICENSE NO. GS43304, DATED 02-04-2019.
2. ELEVATIONS ARE BASED ON NAVD83 DATUM.
3. BEARINGS ARE BASED ON NEW JERSEY STATE PLANE COORDINATE SYSTEM (NAD83).



EXISTING CONDITIONS AND DEMOLITION PLAN

**METLAR-BODINE HOUSE
 BLOCK 12502 LOT 10.05**

SITUATED IN
**THE TOWNSHIP OF PISCATAWAY
 MIDDLESEX COUNTY, NEW JERSEY**

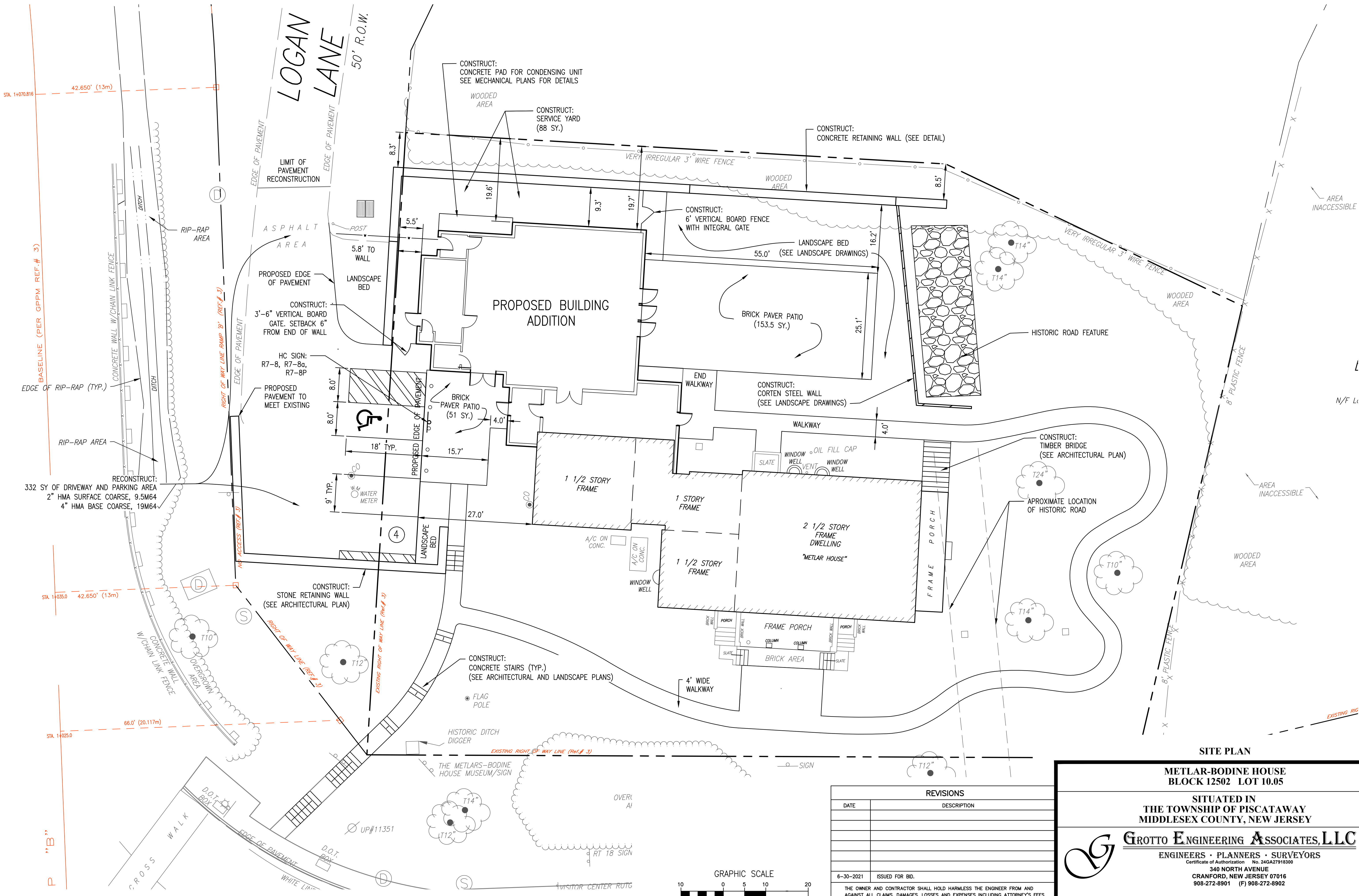
GROTTO ENGINEERING ASSOCIATES, LLC
 ENGINEERS - PLANNERS - SURVEYORS
Certificate of Authorization No. 246227918300
 340 NORTH AVENUE
 CRANFORD, NEW JERSEY 07016
 908-272-8901 (F) 908-272-8902

FRANK W. FARRELL PROFESSIONAL ENGINEER
N.J. LICENSE NO. 51556

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| DATE | DESCRIPTION |
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SITE PLAN

METLAR-BODINE HOUSE
BLOCK 12502 LOT 10.05

SITUATED IN
THE TOWNSHIP OF PISCATAWAY
MIDDLESEX COUNTY, NEW JERSEY

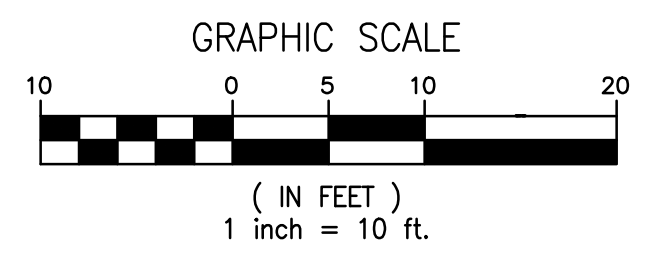
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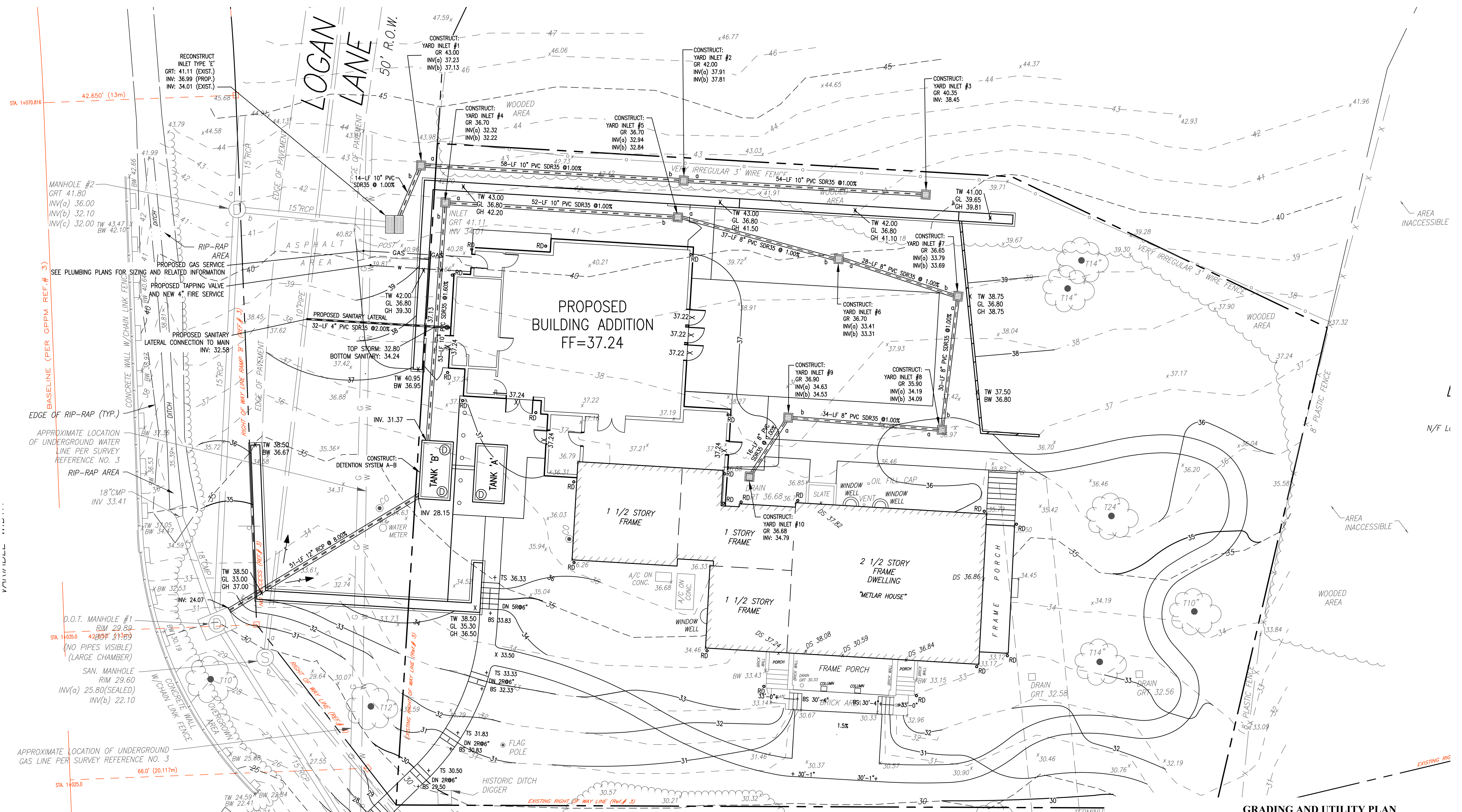
DATE: 08-30-2021 SCALE: 1"=10' DRAWN: AJC CHECKED: FF SHEET: 3 OF 9 JOB: PR-0234

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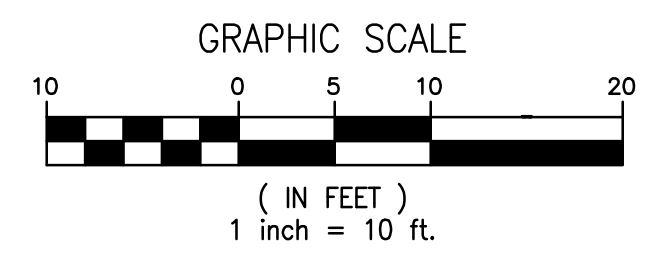
GRADING AND UTILITY PLAN

NOTES

1. ALL ROOF LEADERS SHALL BE CONNECTED TO THE PROPOSED STORM SEWER SYSTEM.

LEGEND

- TW: TOP OF WALL
- GL: GRADE-LOW
- GH: GRADE-HIGH
- RD: ROOF DRAIN



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**METLAR-BODINE HOUSE
BLOCK 12502 LOT 10.05**

**SITUATED IN
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BASELINE (PER GPPM REF.# 3)

APPROXIMATE LOCATION OF UNDERGROUND WATER LINE PER SURVEY REFERENCE NO. 3

APPROXIMATE LOCATION OF UNDERGROUND GAS LINE PER SURVEY REFERENCE NO. 3

AREA INACCESSIBLE

N/F L

AREA INACCESSIBLE

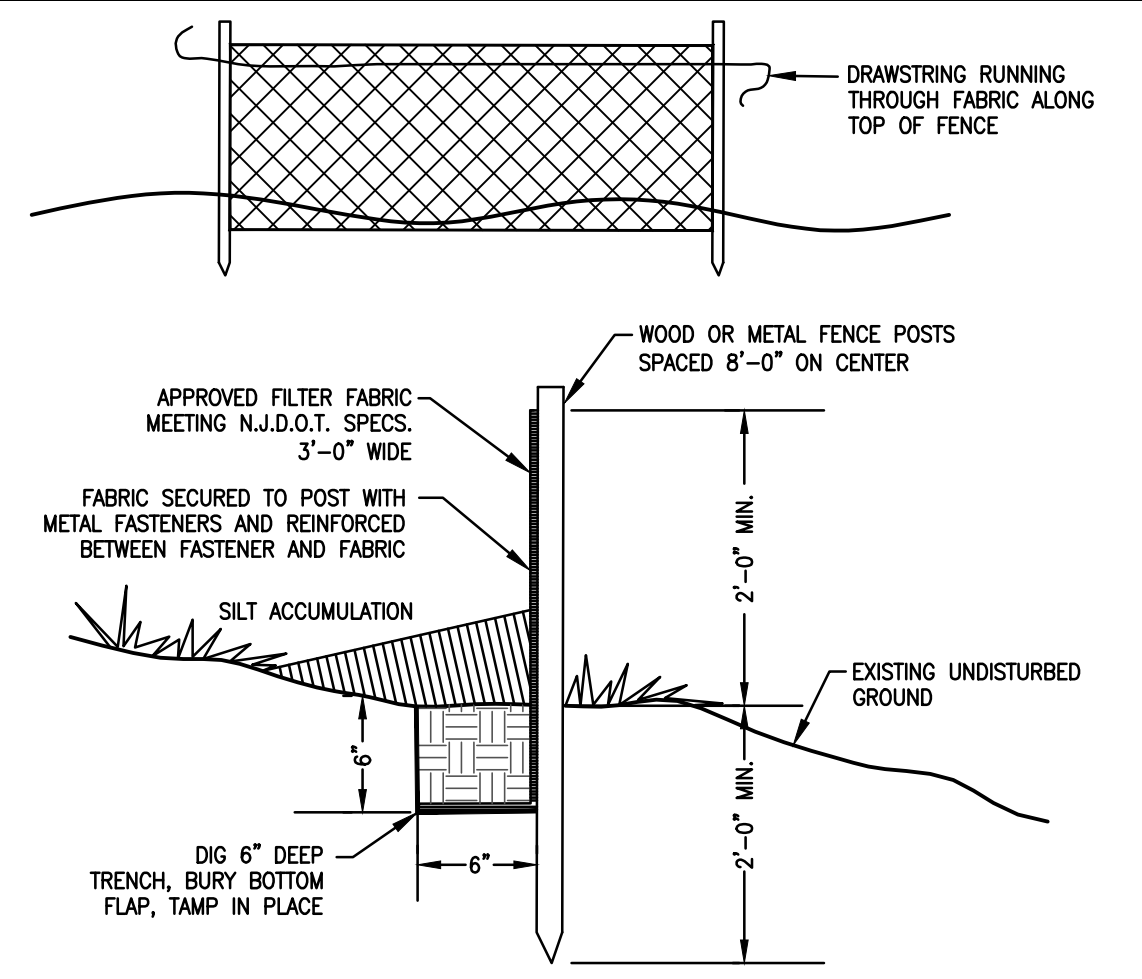
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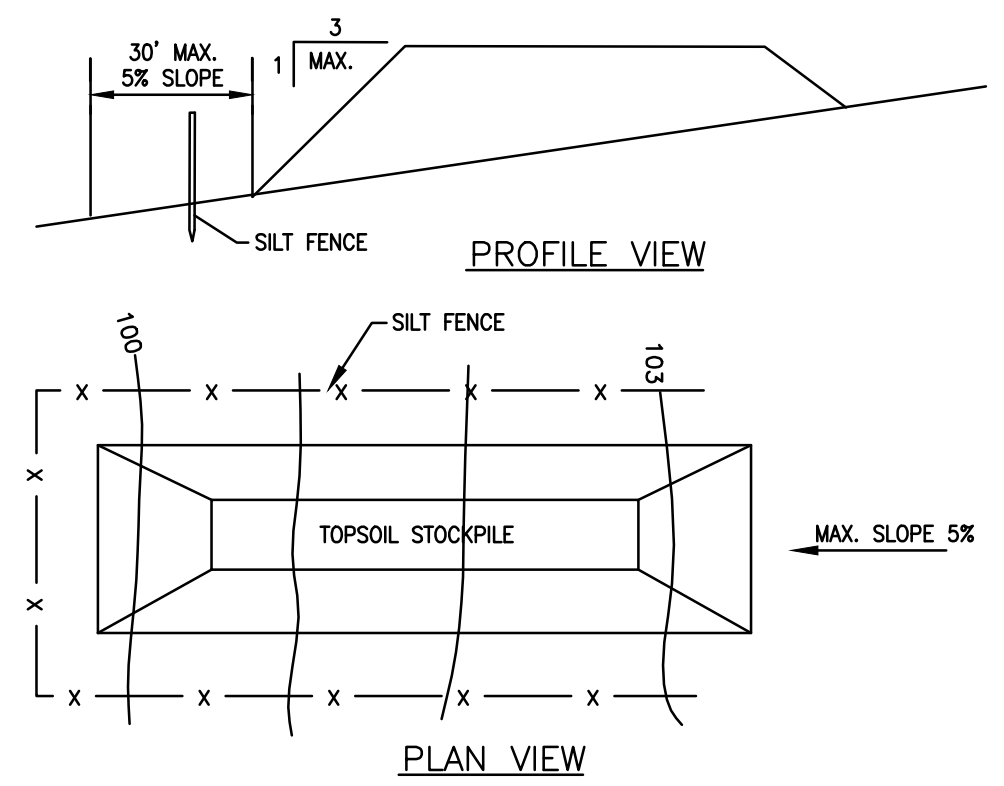
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- REQUIREMENTS FOR SILT FENCE:**
- FENCE POSTS SHALL BE SPACED 8 FEET CENTER-TO-CENTER OR CLOSER. THEY SHALL EXTEND AT LEAST 2 FEET INTO THE GROUND AND EXTEND AT LEAST 2 FEET ABOVE GROUND. POSTS SHALL BE CONSTRUCTED OF HARDWOOD WITH A MINIMUM DIAMETER THICKNESS OF 1-1/2 INCHES.
 - A METAL FENCE WITH 6 INCH OR SMALLER OPENINGS AND AT LEAST 2 FEET HIGH MAY BE UTILIZED. FASTEN TO THE FENCE POSTS TO PROVIDE REINFORCEMENT AND SUPPORT TO THE GEOTEXTILE FABRIC WHERE SPACE FOR OTHER PRACTICES IS LIMITED AND HEAVY SEDIMENT LOADING IS EXPECTED.
 - A GEOTEXTILE FABRIC, RECOMMENDED FOR SUCH USE BY THE MANUFACTURER, SHALL BE BURIED AT LEAST 6 INCHES DEEP IN THE GROUND. THE FABRIC SHALL EXTEND AT LEAST 2 FEET ABOVE THE GROUND. THE FABRIC MUST BE SECURELY FASTENED TO THE POSTS USING A SYSTEM CONSISTING OF METAL FASTENERS (NAILS OR STAPLES) AND A HIGH STRENGTH REINFORCEMENT MATERIAL (NYLON WEBBING, GROMMETS, WASHERS, ETC.) PLACED BETWEEN THE FASTENER AND THE GEOTEXTILE FABRIC. THE FASTENING SYSTEM SHALL RESIST TEARING AWAY FROM THE POST. THE FABRIC SHALL INCORPORATE A DRAWSTRING IN THE TOP PORTION OF THE FENCE FOR ADDED STRENGTH.
 - THE SLOPE OF LAND FOR AT LEAST 30 FT. ADJACENT TO ANY SILT FENCE SHALL NOT EXCEED 5%.
 - SILT FENCE SHALL BE INSTALLED SO THAT WATER CAN NOT BYPASS THE FENCE AROUND ITS ENDS.
 - INSPECTION SHALL BE FREQUENT AND REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS POSSIBLE.
 - WHERE THE LENGTH OF SLOPE ABOVE THE SILT FENCE EXCEEDS 150 FEET, OR THE CONTRIBUTING DRAINAGE AREA EXCEEDS 1 ACRE, SUPER SILT FENCE SHALL BE USED.

SILT FENCE
N.T.S.



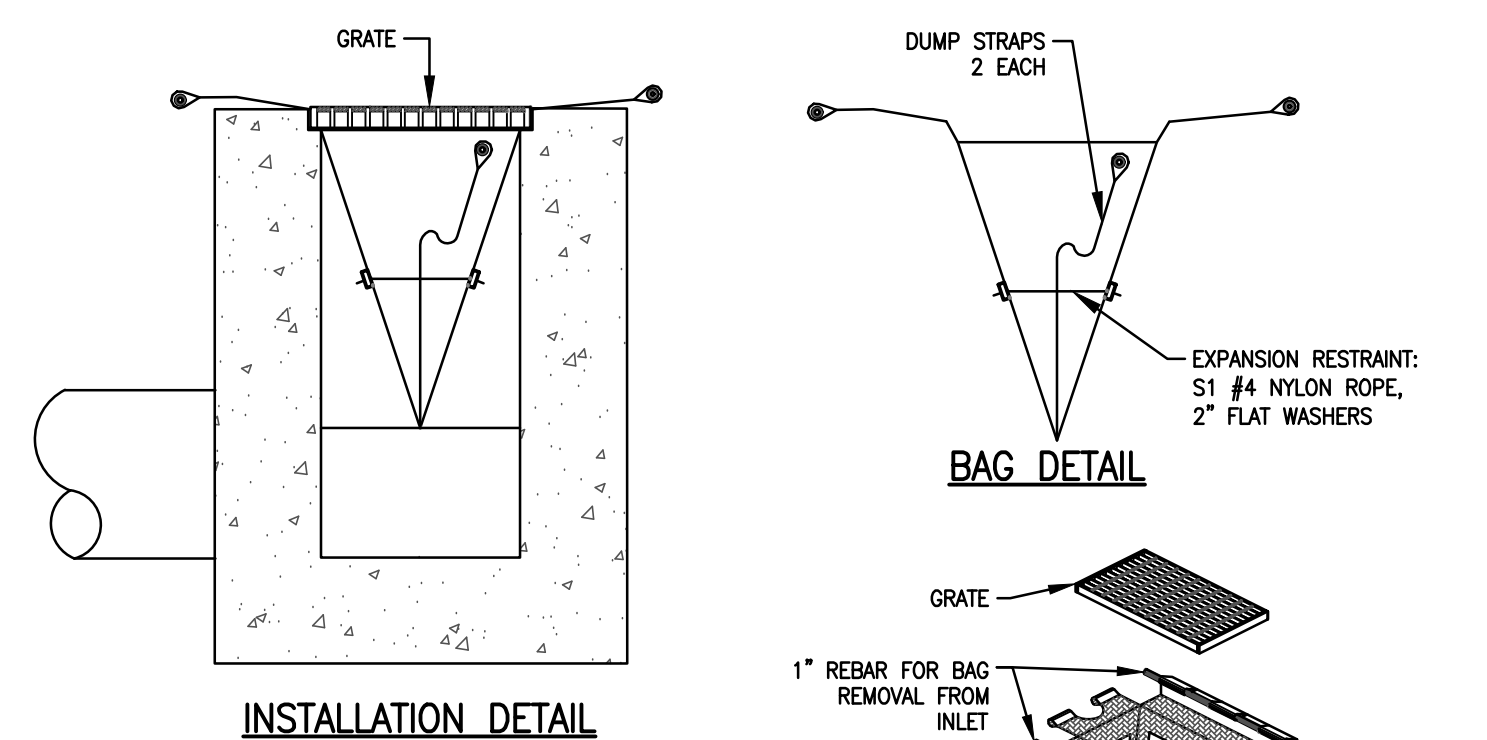
- NOTES:**
- PLACE ALL STOCKPILES AT LOCATIONS AS SHOWN ON THE SOIL EROSION AND SEDIMENT CONTROL PLANS.
 - STOCKPILE SHALL RECEIVE A VEGETATIVE COVER IN ACCORDANCE WITH MINIMUM STABILIZATION REQUIREMENTS.
 - SILT FENCE SHALL BE INSTALLED AS SHOWN HEREDON.

TOPSOIL STOCKPILE
N.T.S.



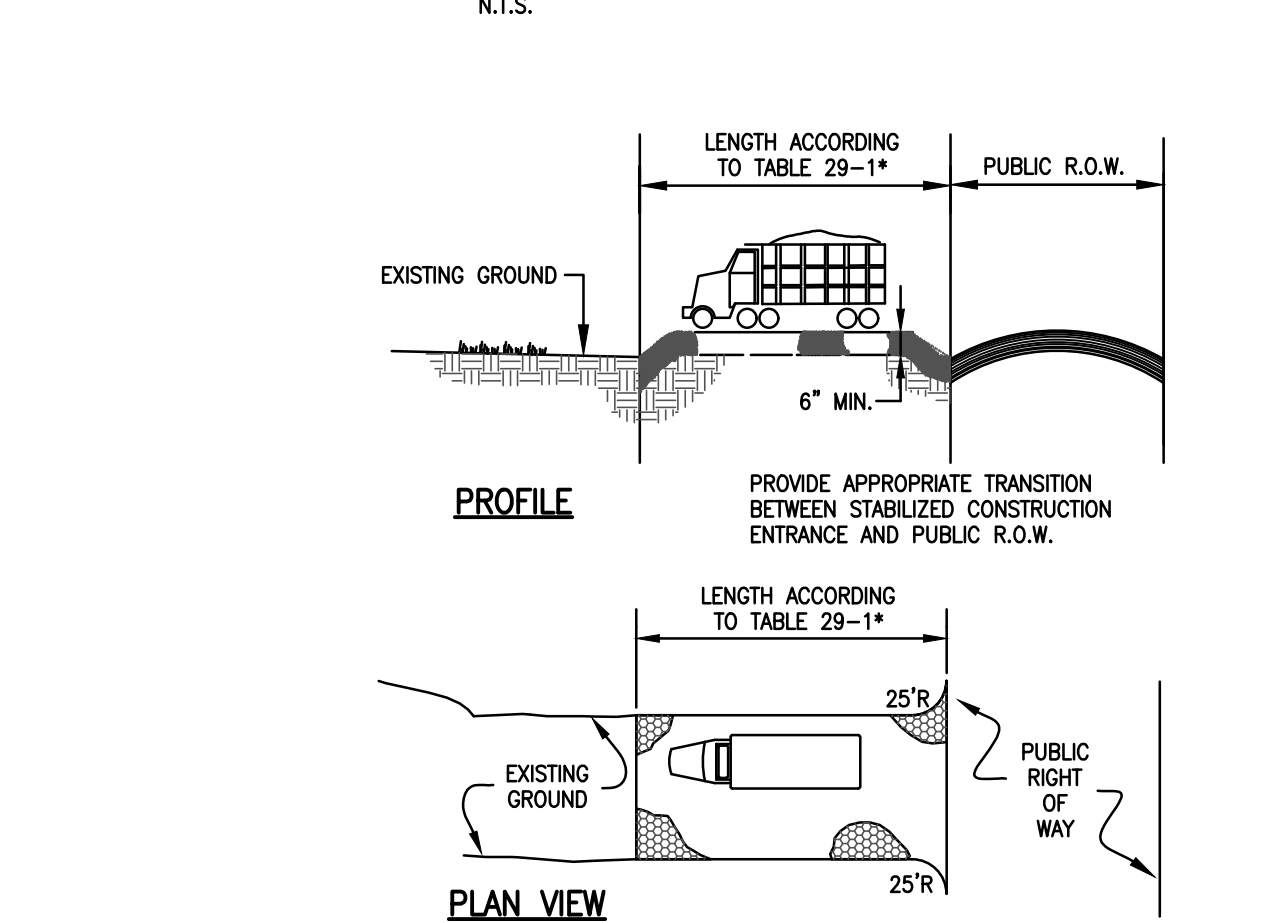
- NOTES:**
- BALES SHALL BE PLACED ON THE TOE OF SLOPE ON THE CONTOUR, AND IN A ROW WITH ENDS TIGHTLY ADJUTING THE ADJACENT BALES.
 - EACH BALE SHALL BE EMBEDDED IN THE SOIL A MINIMUM OF 4" AND PLACED SO THAT BINDINGS ARE HORIZONTAL.
 - BALES SHALL BE SECURELY ANCHORED IN PLACE BY 2 WOODEN OR METAL STAKES DRIVEN THROUGH EACH BALE. THE FIRST STAKE SHALL BE DRIVEN TOWARD THE PREVIOUSLY LAID BALE AT AN ANGLE TO FORCE THE BALES TOGETHER.
 - INSPECTION SHALL BE FREQUENT AND REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.

STAKED HAYBALE FILTER DETAIL
N.T.S.



- NOTES:**
- FILTER TYPES SHALL BE APPROVED BY THE INSPECTOR PRIOR TO INSTALLATION.
 - FILTER BAGS MAY BE REMOVED WHEN SITE IS STABILIZED AT THE DIRECTION OF THE ENGINEER.
 - FILTER BAGS SHALL BE REMOVED PRIOR TO STREET ACCEPTANCE.
 - FILTER BAGS SHALL BE CLEANED OR REPLACED ON A REGULAR BASIS (NOT TO BE MORE THAN HALF FULL AT ANY TIME).

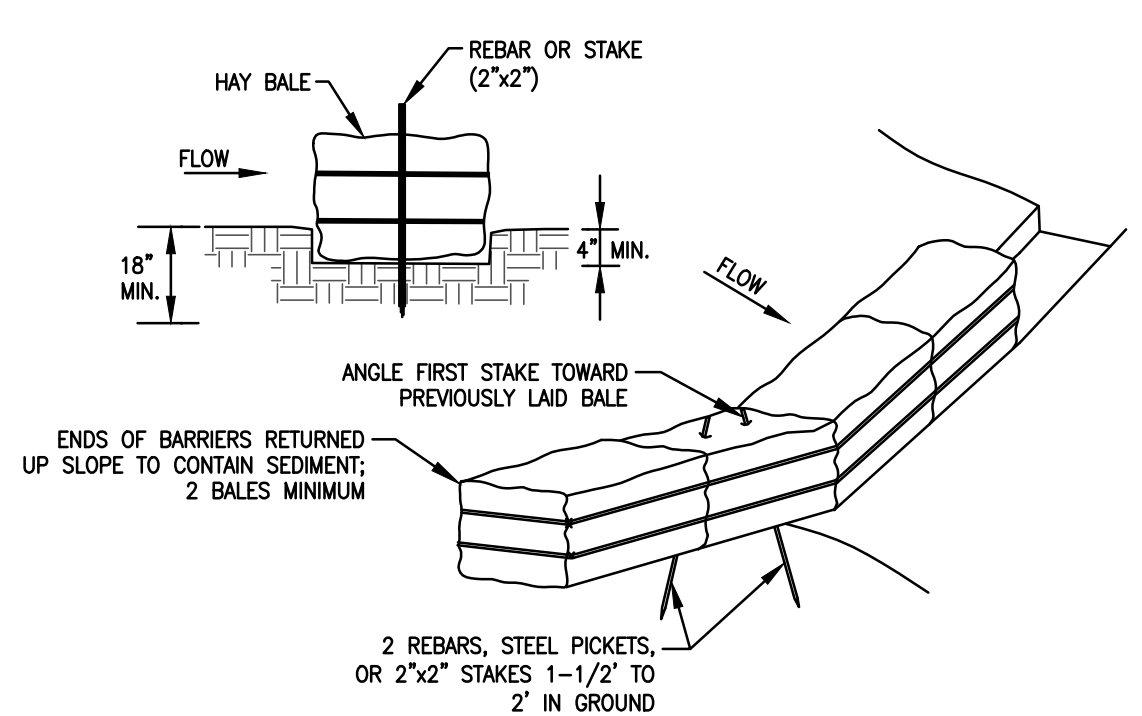
SILT SACK INLET FILTER DETAIL
N.T.S.



| PERCENT SLOPE OF ROADWAY | LENGTH OF STONE REQUIRED | |
|--------------------------|--|--------------------|
| | COARSE GRAINED SOILS | FINE GRAINED SOILS |
| 0 TO 2% | 50 FT | 100 FT |
| 2 TO 5% | 100 FT | 200 FT |
| >5% | ENTIRE SURFACE STABILIZED WITH FABC BASE COURSE ¹ | |

1. AS PRESCRIBED BY LOCAL ORDINANCE OR OTHER GOVERNING AUTHORITY

TEMPORARY STABILIZED CONSTRUCTION ENTRANCE
N.T.S.



- NOTES:**
- BALES SHALL BE PLACED ON THE TOE OF SLOPE ON THE CONTOUR, AND IN A ROW WITH ENDS TIGHTLY ADJUTING THE ADJACENT BALES.
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 - INSPECTION SHALL BE FREQUENT AND REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.

SEEDING SCHEDULE

- TEMPORARY SEEDING SHALL CONSIST OF SPRING OATS APPLIED AT A RATE OF 2.0 LBS. PER 1,000 SF, OR PERENNIAL RYEGRASS APPLIED AT A RATE OF 1.0 LBS PER 1,000 SF. TEMPORARY SEEDING TO BE MAINTAINED UNTIL DISTURBED AREAS ARE PERMANENTLY STABILIZED WITH PERMANENT SEEDING. IF ANY SERIOUS EROSION PROBLEMS OCCUR, THE ERODED AREAS SHALL BE REPAIRED AND STABILIZED WITH A MULCH AS INDICATED IN NOTE NO. 6. THE OPTIMUM SEEDING DATE IS MARCH 1 THROUGH MAY 15 AND AUGUST 15 THROUGH OCTOBER 1 FOR PERENNIAL RYE AND SPRING OATS.
- PERMANENT SEEDING SHALL CONSIST OF THE FOLLOWING MIXTURE OR APPROVED EQUAL. OPTIMAL PLANTING DATES ARE AUGUST 15 THROUGH OCTOBER 15. THE ACCEPTABLE PLANTING DATE IS MAY 1 THROUGH AUGUST 14.

WELL TO MODERATELY WELL DRAINED LOTS (MIXTURE #14):

| | |
|----------------------------|------------------|
| TALL FESCUE | 6.0 LBS/1,000 SF |
| KENTUCKY BLUEGRASS (BLEND) | 0.5 LBS/1,000 SF |
| PERENNIAL RYEGRASS (BLEND) | 0.5 LBS/1,000 SF |

- FERTILIZER FOR THE ESTABLISHMENT OF TEMPORARY VEGETATIVE COVER SHALL BE 10-20-10 APPLIED AT A RATE OF 11 LBS PER 1,000 SF OR AS DETERMINED BY SOIL TESTS. FERTILIZER FOR THE ESTABLISHMENT OF PERMANENT VEGETATIVE COVER SHALL BE 10-10-10 APPLIED AT A RATE OF 11 LBS PER 1,000 SF OR AS DETERMINED BY SOIL TESTS. LIMESTONE FOR TEMPORARY AND PERMANENT SEEDING SHALL BE APPLIED AT A RATE OF 90 TO 115 LBS PER 1,000 SF AND ANCHORED WITH A MULCH ANCHORING TOOL OR LIQUID MULCH BINDER.
- MULCHING IS REQUIRED ON ALL SEEDING. SEE MULCHING NOTES, THIS SHEET.
- IF SEASON PREVENTS THE ESTABLISHMENT OF TEMPORARY OR PERMANENT SEEDING, EXPOSED AREAS TO BE STABILIZED WITH MULCH AS INDICATED IN NOTE NO. 6.

- MULCH TO CONSIST OF SMALL GRAIN STRAW OR SALT HAY ANCHORED WITH A WOOD AND FIBER MULCH BINDER OR AN APPROVED EQUAL. MULCH WILL BE SPREAD AT A RATE OF 90 TO 115 LBS PER 1,000 SF AND ANCHORED WITH A MULCH ANCHORING TOOL OR LIQUID MULCH BINDER.
- WORK LIME AND FERTILIZER INTO THE SOIL AS NEARLY AS PRACTICAL TO A DEPTH OF 4 INCHES WITH A DISC, SPRING-TOOTHED HARROW, OR OTHER SUITABLE EQUIPMENT. THE FINAL HARROWING OR DISCING OPERATION SHOULD BE ON THE GENERAL CONTOUR. CONTINUE TILLAGE UNTIL A REASONABLY UNIFORM, FINE SEEDBED IS PREPARED. ALL BUT CLAY OR SILTY SOILS AND COARSE SANDS SHOULD BE ROLLED TO FIRM THE SEEDBED WHEREVER FEASIBLE.
- REMOVE FROM THE SURFACE ALL STONES TWO INCHES OR LARGER IN ANY DIMENSION. REMOVE ALL OTHER DEBRIS SUCH AS WIRE, CABLE, TREE ROOTS, PIECES OF CONCRETE, CLODS, LUMPS OR OTHER UNSUITABLE MATERIALS.
- INSPECT SEEDBED JUST BEFORE SEEDING. IF TRAFFIC HAS LEFT THE SOIL COMPACTED, THE AREA MUST BE RE-TILLED AND FIRMED AS ABOVE.

CONSTRUCTION SCHEDULE

- CLEAR PROPOSED ENTRANCE AND PLACE STABILIZED CONSTRUCTION ENTRANCE AS SHOWN ON PLANS. 2 DAYS
- INSTALL SILT FENCE ADJACENT TO THE LIMIT OF SOIL DISTURBANCE AS SHOWN. 2 DAYS
- CLEAR LAND AREAS TO BE DEVELOPED. TREES SHALL REMAIN WHEREVER POSSIBLE. 3 DAYS
- STOCKPILE AND SEED OR MULCH TOPSOIL. 1 DAY
- ROUGH GRADE THE SITE. STABILIZE ALL AREAS NOT SUBJECT TO CONSTRUCTION TRAFFIC THAT WILL REMAIN EXPOSED FOR MORE THAN 30 DAYS. 1 WEEK
- INSTALLATION OF UTILITIES WITH EROSION CONTROL DEVICES (TEMPORARY SEEDING, INLET PROTECTION AND TEMPORARY STABILIZATION). 2 DAYS
- CONSTRUCT BUILDING ADDITION. 2 MONTHS
- CONSTRUCT PATIO AND WALKWAYS. 2 WEEKS
- PAVE PARKING AREA AND DRIVEWAY. 1 WEEK
- INSTALL LANDSCAPING WITH PERMANENT SEEDING, FERTILIZING AND MULCH. 2 WEEKS
- WHEN AREA IS STABILIZED, SEDIMENT CONTROL STRUCTURES CAN BE REMOVED. 2 DAYS

MULCHING NOTES

- GRADING SHALL BE PERFORMED AS PER STANDARDS FOR LAND GRADING IN THE "STANDARDS FOR SOIL EROSION AND SEDIMENT CONTROL IN NEW JERSEY", SECTION 19.1.
- PERMANENT SEED SHALL BE APPLIED AS PER STANDARD OF THIS SHEET.
- STRAW OR HAY MULCHING IS REQUIRED ON ALL SEEDING AND SHALL CONSIST OF THE FOLLOWING: UNROTTED SMALL GRAIN STRAW, HAY FREE OF SEEDS, TO BE APPLIED AT THE RATE OF 1-1/2 TO 2 TONS PER ACRE (70 TO 90 POUNDS PER 1,000 SQUARE FEET).
- SPREAD MULCH UNIFORMLY BY HAND OR MECHANICALLY SO THAT APPROXIMATELY 85% OF THE SOIL SURFACE IS COVERED.
- LIQUID MULCH BINDER (TACKIFIER) SHALL BE APPLIED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

VEGETATIVE COVER MAINTENANCE NOTES

- MAINTENANCE SHOULD OCCUR ON A REGULAR BASIS, CONSISTENT WITH FAVORABLE PLANT GROWTH, SOIL AND CLIMATIC CONDITIONS. THIS INVOLVES REGULAR SEASONAL WORK FOR MOWING, FERTILIZING, LIMING, WATER, PRUNING, FIRE CONTROL, WEED AND PEST CONTROL, RE-SEEDING AND TIMELY REPAIRS.
- MOWING ON IMPROVED AREAS, SUCH AS LAWNS, CERTAIN RECREATION FIELDS AND PICNIC AREAS SHALL BE FREQUENT ON SEMI-IMPROVED AREAS. MOWING WILL BE INFREQUENT. UNIMPROVED AREAS MAY BE LEFT UNMOWED TO PERMIT NATURAL SUCCESSION.
- FERTILIZER SHOULD BE APPLIED AS NEEDED TO MAINTAIN A DENSE STAND OR DESIRABLE SPECIES. FREQUENTLY MOWED AREAS AND THOSE AREAS ON SANDY SOILS WILL REQUIRE MORE FERTILIZATION.
- LIME REQUIREMENT SHOULD BE DETERMINED BY SOIL TESTING TO BE DONE EVERY 2 OR 3 YEARS. FERTILIZATION WILL INCREASE THE NEED FOR LIMING.
- WEED INVASION MAY RESULT FROM ABUSIVE MOWING AND INADEQUATE FERTILIZATION AND LIMING. BRUSH INVASION IS A COMMON CONSEQUENCE OF LACK OF MOWING. CONTROL OF WEEDS OR BRUSH SHALL BE ACCOMPLISHED BY USING HERBICIDES OR MECHANICAL METHODS.
- THE PROPERTY OWNER OR TENANT BY CONTRACT SHALL BE RESPONSIBLE FOR MAINTENANCE DURING AND AFTER CONSTRUCTION.

SLOPE STABILIZATION NOTES

- GRADE SLOPES AS PER PLAN.
- APPLY LIMESTONE AT A RATE OF APPROXIMATELY 2 TONS PER ACRE AND FERTILIZER AT APPROXIMATELY 500 POUNDS PER ACRE (10-20-10 OR EQUAL).
- WORK LIME AND FERTILIZER INTO SOIL TO A DEPTH OF 4 INCHES.
- APPLY SEED 40 POUNDS PER ACRE BY HAND, CYCLONE SEEDER OR HYDRO-SEEDER.
- ROLL SEED BED TO A UNIFORM COMPACTION.
- MULCH AND STABILIZE AS PER MULCHING AND TACKING SPECIFICATIONS ON THIS SHEET.
- STEEP SLOPES TO BE STABILIZED WITH JUTE MATTING (3:1 OR STEEPER).

SOIL EROSION NOTES

- FREEHOLD SOIL CONSERVATION DISTRICT**
- THE FREEHOLD SOIL CONSERVATION DISTRICT SHALL BE NOTIFIED FORTY-EIGHT (48) HOURS IN ADVANCE OF ANY SOIL DISTURBING ACTIVITY.
 - ALL SOIL EROSION AND SEDIMENT CONTROL PRACTICES ARE TO BE INSTALLED PRIOR TO SOIL DISTURBANCE, OR IN THEIR PROPER SEQUENCE, AND MAINTAINED UNTIL PERMANENT PROTECTION IS ESTABLISHED.
 - ANY CHANGES TO THE CERTIFIED SOIL EROSION AND SEDIMENT CONTROL PLANS WILL REQUIRE THE SUBMISSION OF REVISED SOIL EROSION AND SEDIMENT CONTROL PLANS TO THE DISTRICT FOR RE-CERTIFICATION. THE REVISED PLANS MUST MEET ALL CURRENT STATE SOIL EROSION AND SEDIMENT CONTROL STANDARDS.
 - N.J.S.A. 4:24-39 et. SEQ. REQUIRES THAT NO CERTIFICATES OF OCCUPANCY BE ISSUED BEFORE THE DISTRICT DETERMINES THAT A PROJECT OR PORTION THEREOF IS IN FULL COMPLIANCE WITH THE CERTIFIED PLAN AND STANDARDS FOR SOIL EROSION AND SEDIMENT CONTROL IN NEW JERSEY AND A REPORT OF COMPLIANCE HAS BEEN ISSUED. UPON WRITTEN REQUEST FROM THE APPLICANT, THE DISTRICT MAY ISSUE A REPORT OF COMPLIANCE WITH CONDITIONS ON A LOT-BY-LOT OR SECTION-BY-SECTION BASIS, PROVIDED THAT THE PROJECT OR PORTION THEREOF IS IN SATISFACTORY COMPLIANCE WITH THE SEQUENCE OF DEVELOPMENT AND TEMPORARY MEASURES FOR SOIL EROSION AND SEDIMENT CONTROL HAVE BEEN IMPLEMENTED, INCLUDING PROVISIONS FOR STABILIZATION AND SITE WORK.
 - ANY DISTURBED AREAS THAT WILL BE LEFT EXPOSED MORE THAN SIXTY (60) DAYS, AND NOT SUBJECT TO CONSTRUCTION TRAFFIC, WILL IMMEDIATELY RECEIVE A TEMPORARY SEEDING. IF THE SEASON PREVENTS THE ESTABLISHMENT OF TEMPORARY COVER, THE DISTURBED AREAS WILL BE MULCHED WITH STRAW, OR EQUIVALENT MATERIAL, AT A RATE OF 2 TO 2 1/2 TONS PER ACRE, ACCORDING TO STATE STANDARD FOR STABILIZATION WITH MULCH ONLY.
 - IMMEDIATELY FOLLOWING INITIAL DISTURBANCE OR ROUGH GRADING, ALL CRITICAL AREAS SUBJECT TO EROSION (I.E. SOIL STOCKPILES, STEEP SLOPES AND ROADWAY EMBANKMENTS) WILL RECEIVE TEMPORARY SEEDING IN COMBINATION WITH STRAW MULCH OR A SUITABLE EQUIVALENT, AND A MULCH ANCHOR, IN ACCORDANCE WITH STATE STANDARDS.
 - A SUB-BASE COURSE WILL BE APPLIED IMMEDIATELY FOLLOWING ROUGH GRADING AND INSTALLATION OF IMPROVEMENTS TO STABILIZE STREETS, ROADS, DRIVEWAYS, AND PARKING AREAS. IN AREAS WHERE NO UTILITIES ARE PRESENT, THE SUB-BASE SHALL BE INSTALLED WITHIN FIFTEEN (15) DAYS OF THE PRELIMINARY GRADING.
 - THE STANDARD FOR STABILIZED CONSTRUCTION ACCESS REQUIRES THE INSTALLATION OF A PAD OF CLEAN CRUSHED STONE AT POINTS WHERE TRAFFIC WILL BE ACCESSING THE CONSTRUCTION SITE. AFTER INTERIOR ROADWAYS ARE PAVED, INDIVIDUAL LOTS REQUIRE A STABILIZED CONSTRUCTION ACCESS CONSISTING OF ONE INCH TO TWO INCH (1" - 2") STONE FOR A MINIMUM LENGTH OF TEN FEET (10') EQUAL TO THE LOT ENTRANCE WIDTH. ALL OTHER ACCESS POINTS SHALL BE BLOCKED OFF.
 - ALL SOIL WASHED, DROPPED, SPILLED, OR TRACKED OUTSIDE THE LIMIT OF DISTURBANCE OR ONTO PUBLIC RIGHTS-OF-WAY WILL BE REMOVED IMMEDIATELY.
 - PERMANENT VEGETATION IS TO BE SEEDDED OR SODDED ON ALL EXPOSED AREAS WITHIN TEN (10) DAYS AFTER FINAL GRADING.
 - AT THE TIME THAT SITE PREPARATION FOR PERMANENT VEGETATIVE STABILIZATION IS GOING TO BE ACCOMPLISHED, ANY SOIL THAT WILL NOT PROVIDE A SUITABLE ENVIRONMENT TO SUPPORT ADEQUATE VEGETATIVE GROUND COVER SHALL BE REMOVED OR TREATED IN SUCH A WAY THAT IT WILL PERMANENTLY ALTER THE SOIL CONDITIONS AND RENDER IT SUITABLE FOR VEGETATIVE GROUND COVER. IF THE REMOVAL OR TREATMENT OF THE SOIL WILL NOT PROVIDE SUITABLE CONDITIONS, NON-VEGETATIVE MEANS OF PERMANENT GROUND STABILIZATION WILL HAVE TO BE EMPLOYED.
 - IN ACCORDANCE WITH THE STANDARD FOR MANAGEMENT OF HIGH ACID PRODUCING SOILS, ANY SOIL HAVING A pH OF 4 OR LESS OR CONTAINING IRON SULFIDES SHALL BE ULTIMATELY PLACED OR BURIED WITH LIMESTONE APPLIED AT THE RATE OF 10 TONS/ACRE, (OR 450 LBS/1,000 SQ. FT. OF SURFACE AREA) AND COVERED WITH A MINIMUM OF 12" OF SETTLED SOIL WITH A pH OF 5 OR MORE, OR 24" WHERE TREES OR SHRUBS ARE TO BE PLANTED.
 - CONDUIT OUTLET PROTECTION MUST BE INSTALLED AT ALL REQUIRED OUTFALLS PRIOR TO THE DRAINAGE SYSTEM BECOMING OPERATIONAL.
 - UNFILTERED DEWATERING IS NOT PERMITTED. NECESSARY PRECAUTIONS MUST BE TAKEN DURING ALL DEWATERING OPERATIONS TO MINIMIZE SEDIMENT TRANSFER. ANY DEWATERING METHODS USED MUST BE IN ACCORDANCE WITH THE STANDARD FOR DEWATERING.
 - SHOULD THE CONTROL OF DUST AT THE SITE BE NECESSARY, THE SITE WILL BE SPRINKLED UNTIL THE SURFACE IS WET. TEMPORARY VEGETATIVE COVER SHALL BE ESTABLISHED OR MULCH SHALL BE APPLIED AS REQUIRED BY THE STANDARD FOR DUST CONTROL.
 - STOCKPILE AND STAGING LOCATIONS ESTABLISHED IN THE FIELD SHALL BE PLACED WITHIN THE LIMIT OF DISTURBANCE ACCORDING TO THE CERTIFIED PLAN. STAGING AND STOCKPILES NOT LOCATED WITHIN THE LIMIT OF DISTURBANCE WILL REQUIRE CERTIFICATION OF A REVISED SOIL EROSION AND SEDIMENT CONTROL PLAN. CERTIFICATION OF A NEW SOIL EROSION AND SEDIMENT CONTROL PLAN MAY BE REQUIRED FOR THESE ACTIVITIES IF AN AREA GREATER THAN 5,000 SQUARE FEET IS DISTURBED.
 - ALL SOIL STOCKPILES ARE TO BE TEMPORARILY STABILIZED WITH SOIL EROSION AND SEDIMENT CONTROL NOTE #6.
 - THE PROPERTY OWNER SHALL BE RESPONSIBLE FOR ANY EROSION OR SEDIMENTATION THAT MAY OCCUR BELOW STORMWATER OUTFALLS OR OFFSITE AS A RESULT OF CONSTRUCTION OF THE PROJECT.

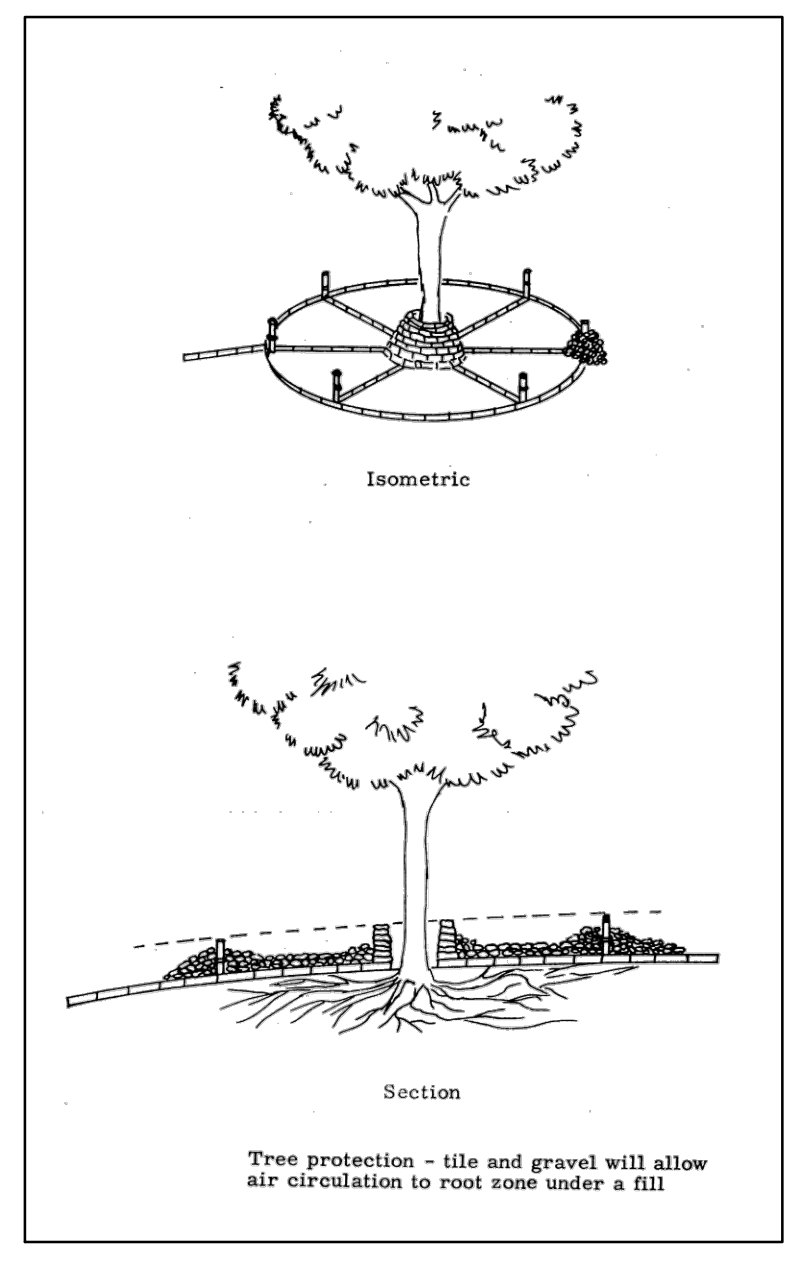
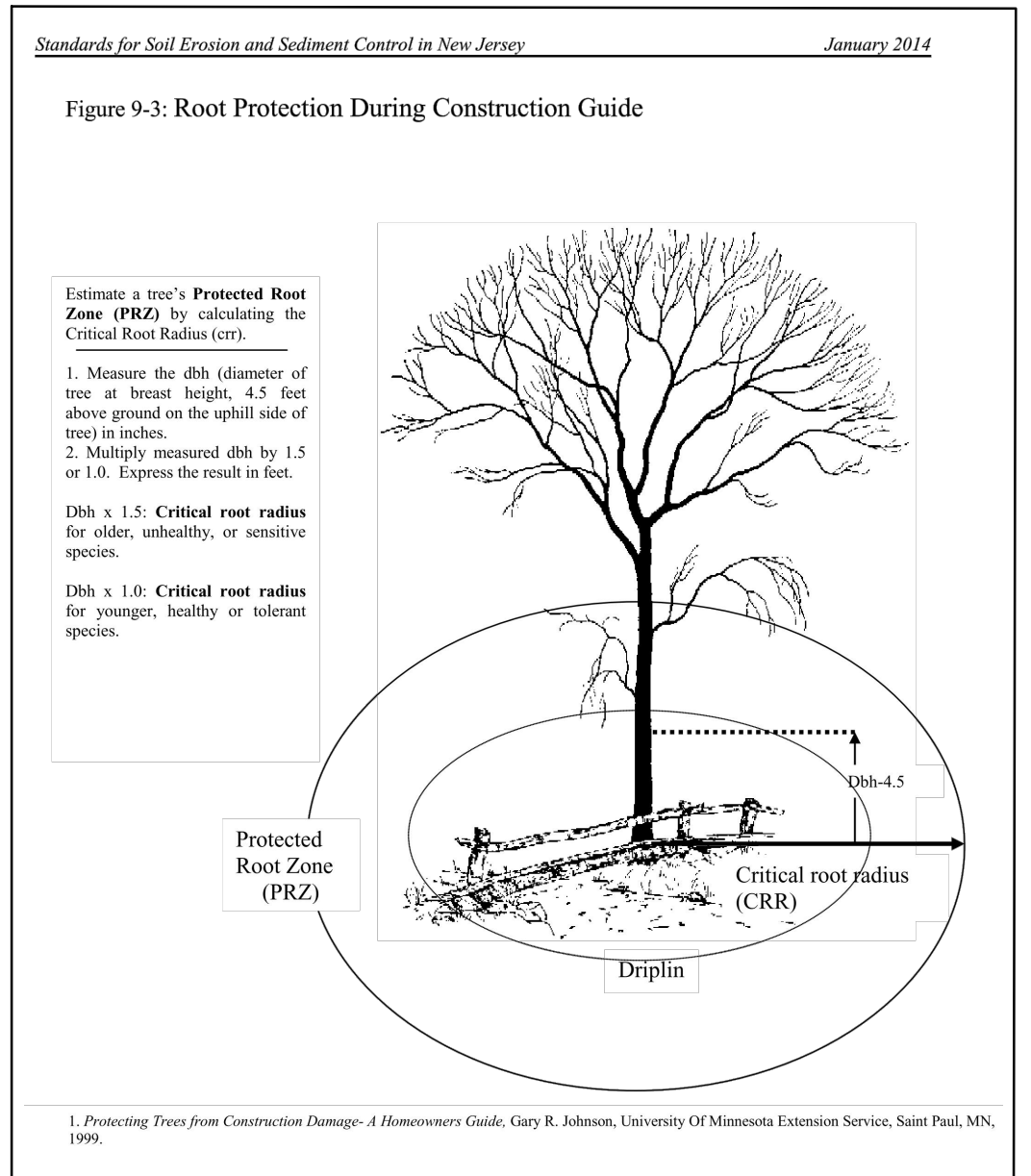
- STOCKPILES ARE NOT TO BE LOCATED WITHIN 50 FEET OF A FLOOD PLAIN, SLOPE, ROADWAY, OR DRAINAGE FACILITY. THE BASE OF ALL STOCKPILES SHALL BE PROTECTED BY A HAY BALE BARRIER OR SEDIMENT CONTROL FENCE.
- THE SITE SHALL AT ALL TIMES, BE GRADED AND MAINTAINED SUCH THAT ALL STORMWATER RUNOFF IS DIVERTED TO SOIL EROSION AND SEDIMENT CONTROL FACILITIES.
- ALL SEDIMENTATION STRUCTURES SHALL BE INSPECTED AND MAINTAINED ON A REGULAR BASIS.
- THE SOIL CONSERVATION DISTRICT MAY REQUEST ADDITIONAL MEASURES TO MINIMIZE ON-SITE OR OFF-SITE SOIL EROSION PROBLEMS DURING CONSTRUCTION.
- ANY CONVEYANCE OF THIS PROJECT OR PORTION THEREOF PRIOR TO ITS COMPLETION WILL TRANSFER FULL RESPONSIBILITY FOR COMPLIANCE WITH THE CERTIFIED PLAN TO ANY SUBSEQUENT OWNER.
- THE CONTRACTOR SHALL MAINTAIN PERMANENT SOIL EROSION AND SEDIMENT CONTROL MEASURES DURING CONSTRUCTION. THE OWNER SHALL MAINTAIN SAID MEASURES THEREAFTER.
- THE SOIL EROSION AND SEDIMENT CONTROL PLAN IS TO BE USED FOR SOIL EROSION AND SEDIMENT CONTROL PURPOSES ONLY.

GENERAL SOIL EROSION NOTES:

- MULCHES: SEE STABILIZATION SPECIFICATION.
- TILLAGE: TO ROUGHEN THE SURFACE AND BRING CLODS TO THE SURFACE. THIS IS A TEMPORARY EMERGENCY MEASURE WHICH SHOULD BE USED BEFORE SOIL BLOWING STARTS. BEGIN PLOWING ON WINDWARD SIDE OF SITE. CHISEL TYPE PLOWING SPACED APPROXIMATELY 12" APART, AND SPRING-TOOTHED HARROWS ARE EXAMPLES OF EQUIPMENT WHICH MAY PRODUCE THE DESIRED EFFECT.
- SPRINKLING: SITE IS SPRINKLED UNTIL THE SURFACE IS WET.
- BARRIERS: BALES OF HAY AND/OR SILT FENCE CAN BE USED TO CONTROL AIR CURRENTS AND SOIL BLOWING.

DUST CONTROL NOTES

- ANY OF THE FOLLOWING METHODS SHALL BE USED FOR DUST CONTROL:
- MULCHES: SEE STABILIZATION SPECIFICATION.
 - TILLAGE: TO ROUGHEN THE SURFACE AND BRING CLODS TO THE SURFACE. THIS IS A TEMPORARY EMERGENCY MEASURE WHICH SHOULD BE USED BEFORE SOIL BLOWING STARTS. BEGIN PLOWING ON WINDWARD SIDE OF SITE. CHISEL TYPE PLOWING SPACED APPROXIMATELY 12" APART, AND SPRING-TOOTHED HARROWS ARE EXAMPLES OF EQUIPMENT WHICH MAY PRODUCE THE DESIRED EFFECT.
 - SPRINKLING: SITE IS SPRINKLED UNTIL THE SURFACE IS WET.
 - BARRIERS: BALES OF HAY AND/OR SILT FENCE CAN BE USED TO CONTROL AIR CURRENTS AND SOIL BLOWING.



TREE PROTECTION DETAIL
N.T.S.

SOIL EROSION AND SEDIMENT CONTROL DETAILS - 1

**METLAR-BODINE HOUSE
BLOCK 12502 LOT 10.05**

**SITUATED IN
THE TOWNSHIP OF PISCATAWAY
MIDDLESEX COUNTY, NEW JERSEY**

GROTTO ENGINEERING ASSOCIATES, LLC
ENGINEERS • PLANNERS • SURVEYORS
Certificate of Authorization No. 246227918300
340 NORTH AVENUE
CRANFORD, NEW JERSEY 07016
908-272-8901 (F) 908-272-8902

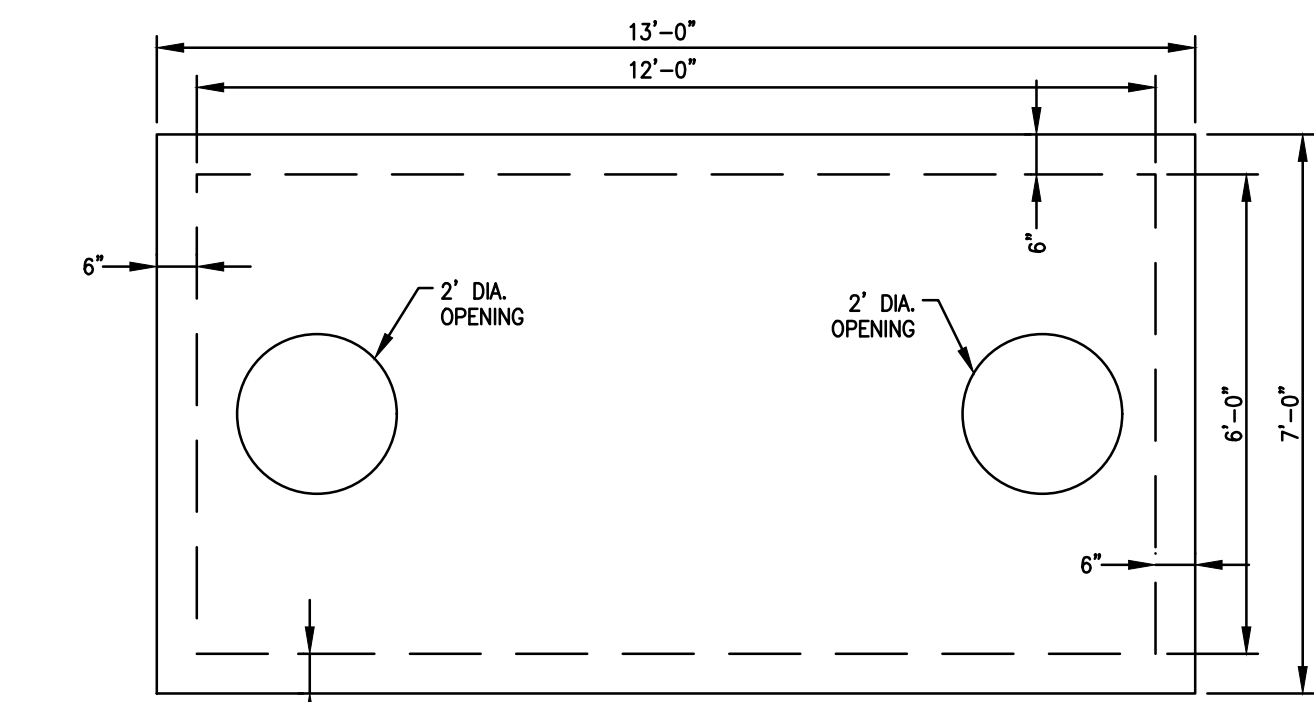
FRANK W. FARRELL
PROFESSIONAL ENGINEER
N.J. LICENSE NO. 51556

DATE: 08-30-2021 SCALE: DRAWN: AJC CHECKED: FF SHEET: 6 OF 9 JOB: PR-0234

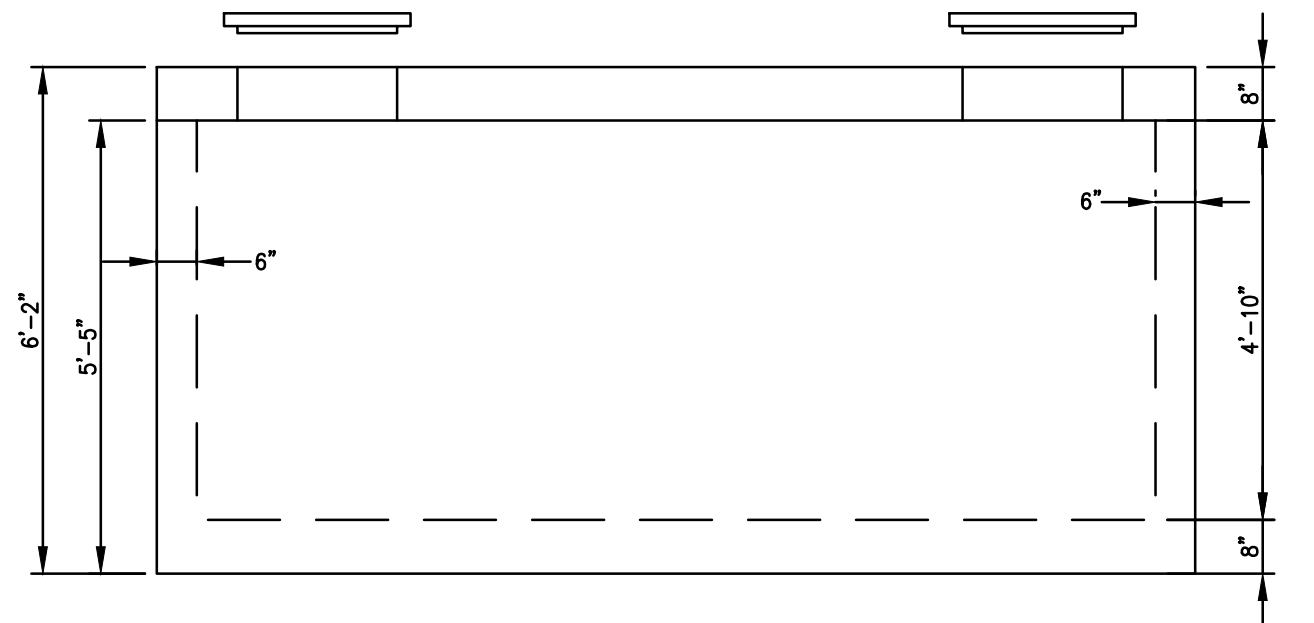
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| 6-30-2021 | ISSUED FOR BID. |

THE OWNER AND CONTRACTOR SHALL HOLD HARMLESS THE ENGINEER FROM AND AGAINST ALL CLAIMS, DAMAGES, LOSSES AND EXPENSES INCLUDING ATTORNEY'S FEES ARISING OUT OF OR RESULTING FROM THE PERFORMANCE OF THE WORK BY THE CONTRACTOR. CHANGES TO THE PLANS BY THE OWNER AND THE CONTRACTOR SHALL BE THE RESPONSIBILITY OF THE PERSONS MAKING SUCH CHANGES. THE CONTRACTOR SHALL CHECK AND VERIFY ALL PLAN DIMENSIONS AND CONDITIONS BEFORE PROCEEDING WITH CONSTRUCTION.

S:\Grotto Projects\PR-0234 - Metlar-Bodine House (Conroy & Hickey)\Sheet\Metlar-Bodine Site Plan C 6-30-2021.dwg 6/29/2021



TOP VIEW

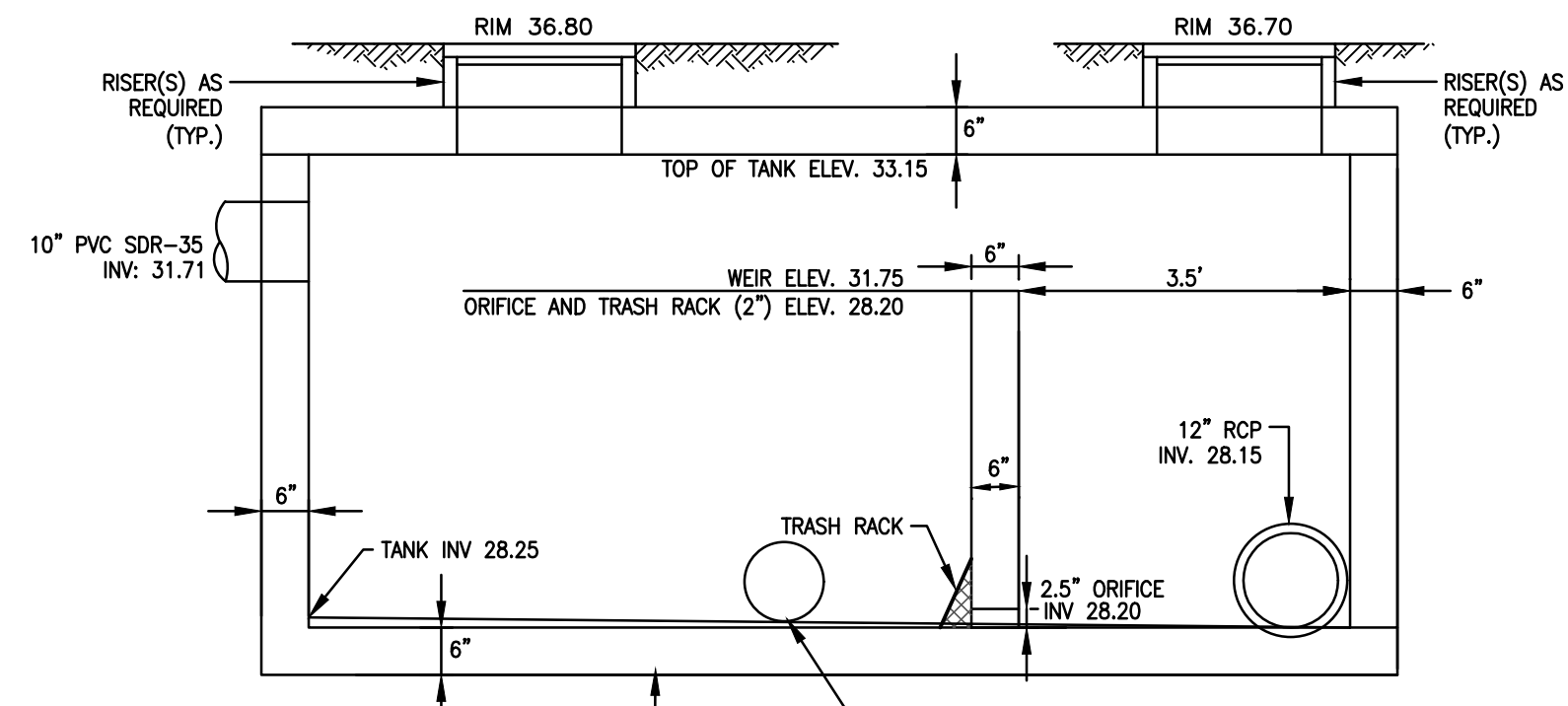


SIDE VIEW

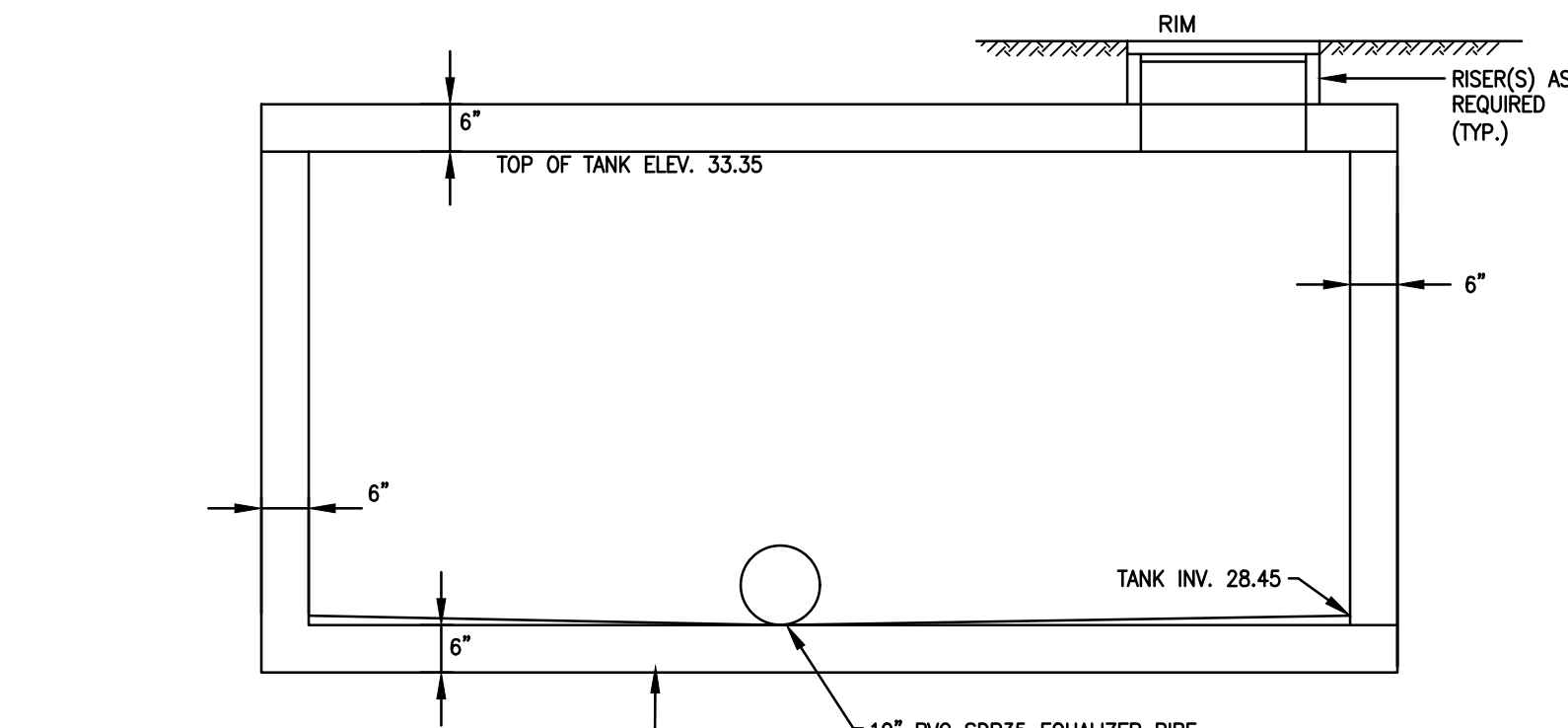
- NOTES:
- HEAVY DUTY SEPTIC TANK AS MANUFACTURED BY M&W PRECAST OR APPROVED EQUAL.
 - MAXIMUM 5" OF COVER FOR H2O LOADING.
 - NOT INTENDED FOR CONSTRUCTION VEHICLES TO DRIVE ON OR OVER.
 - FOR INLET AND OUTLET LOCATIONS AND INVERTS SEE PLAN.

2000 GALLON DETENTION SYSTEM TANK DETAIL

N.T.S.



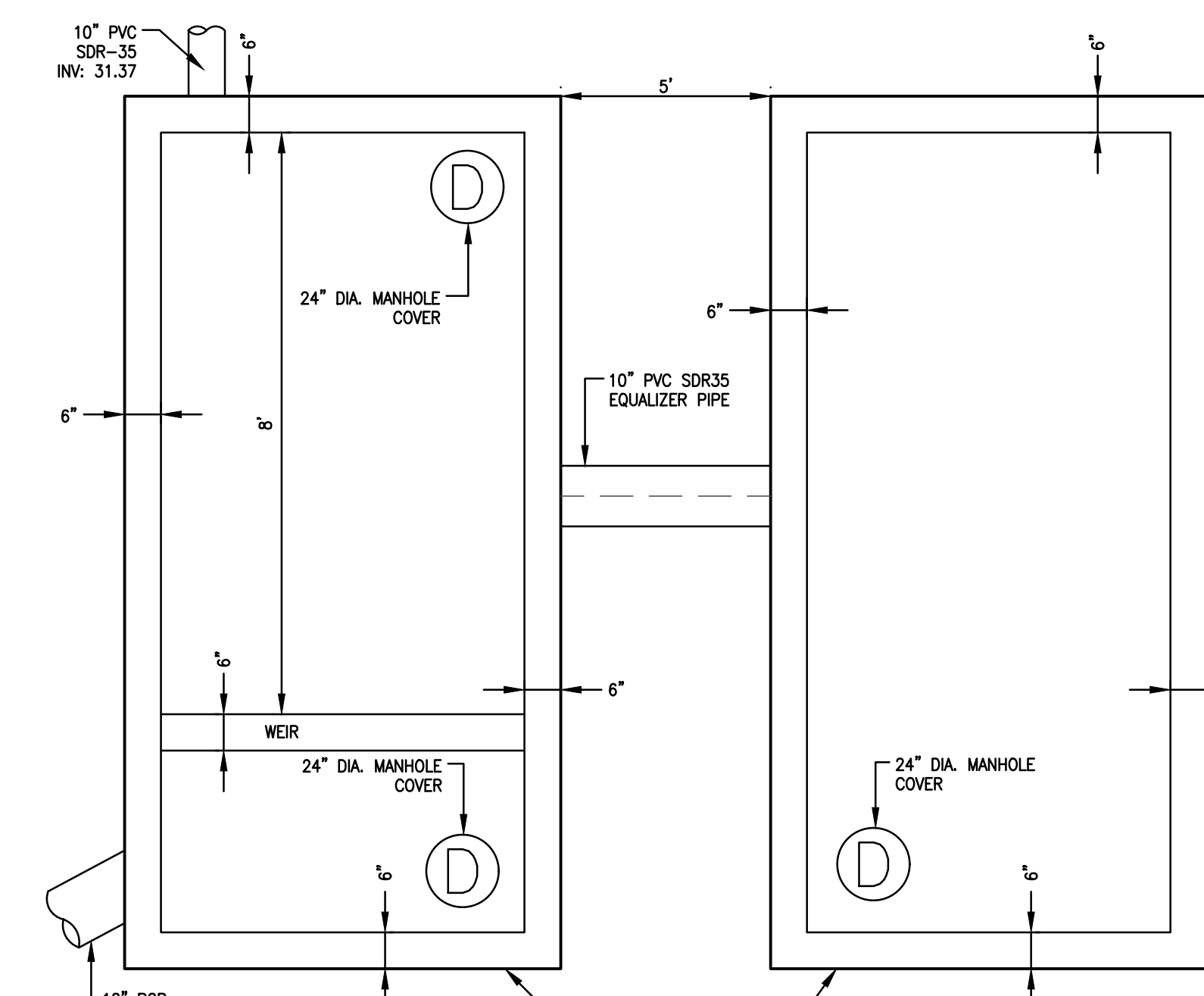
TANK 'B'



TANK 'A'

SCHEMATIC OF DETENTION SYSTEM TANK ARRANGEMENT

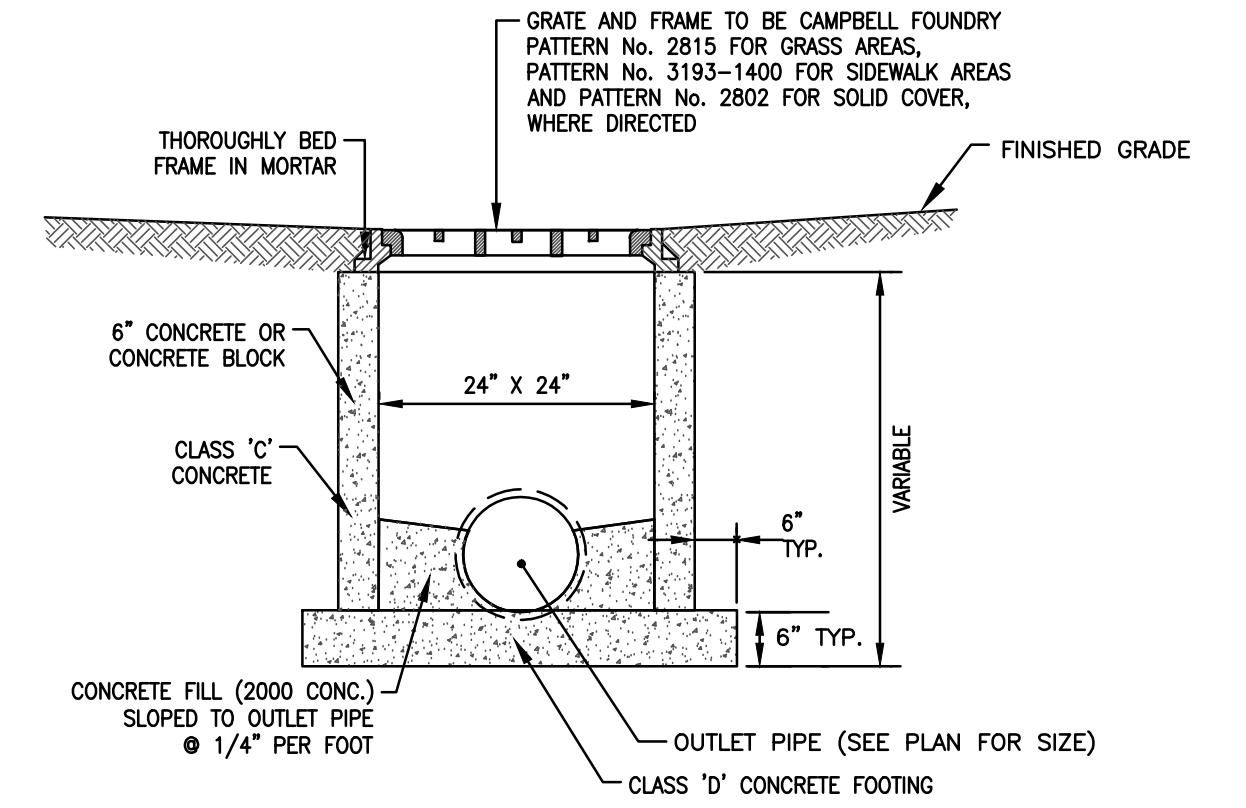
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TOP VIEW

DETENTION SYSTEM NOTES

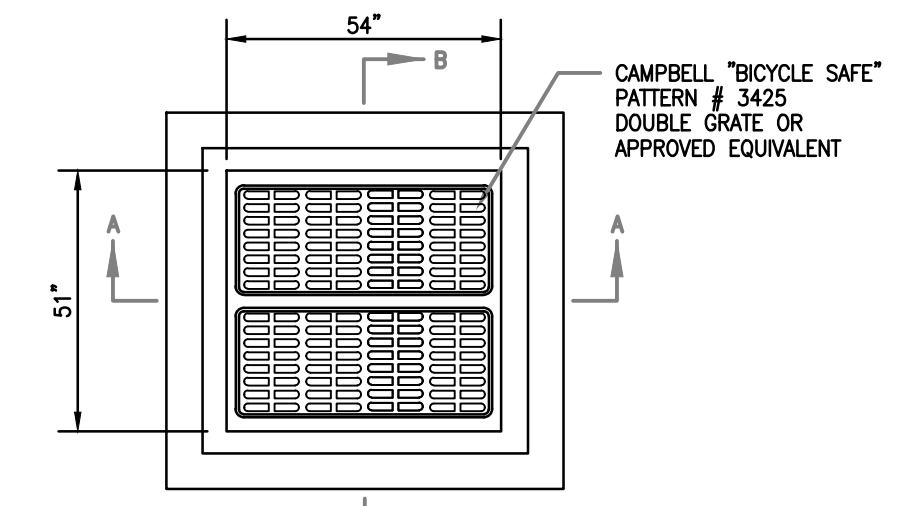
- ALL JOINTS MUST BE MADE WATERTIGHT USING A PVC WATERSTOP, OR APPROVED EQUAL, AS SHOWN.
- ALL SURFACES BOTH INTERIOR AND EXTERIOR, ARE TO BE TREATED WITH A COAL TAR EPOXY, OR APPROVED EQUAL, TO PREVENT THE MOVEMENT OF WATER.
- CHAMBERS SHALL BE PRECAST UNITS OR THEY SHALL BE POUR-IN-PLACE. NO BLOCK CONSTRUCTION SHALL BE PERMITTED.
- A TRASH RACK SHALL BE INSTALLED TO PROTECT THE ORIFICE FROM CLOGGING.
- CONCRETE STRENGTH SHALL BE A MINIMUM OF 4000 PSI AT 28 DAYS.
- TANKS SHALL BE DESIGNED TO WITHSTAND AASHTO HS-20 LOADING.
- SEE UTILITY PLAN FOR LAYOUT GUIDANCE.



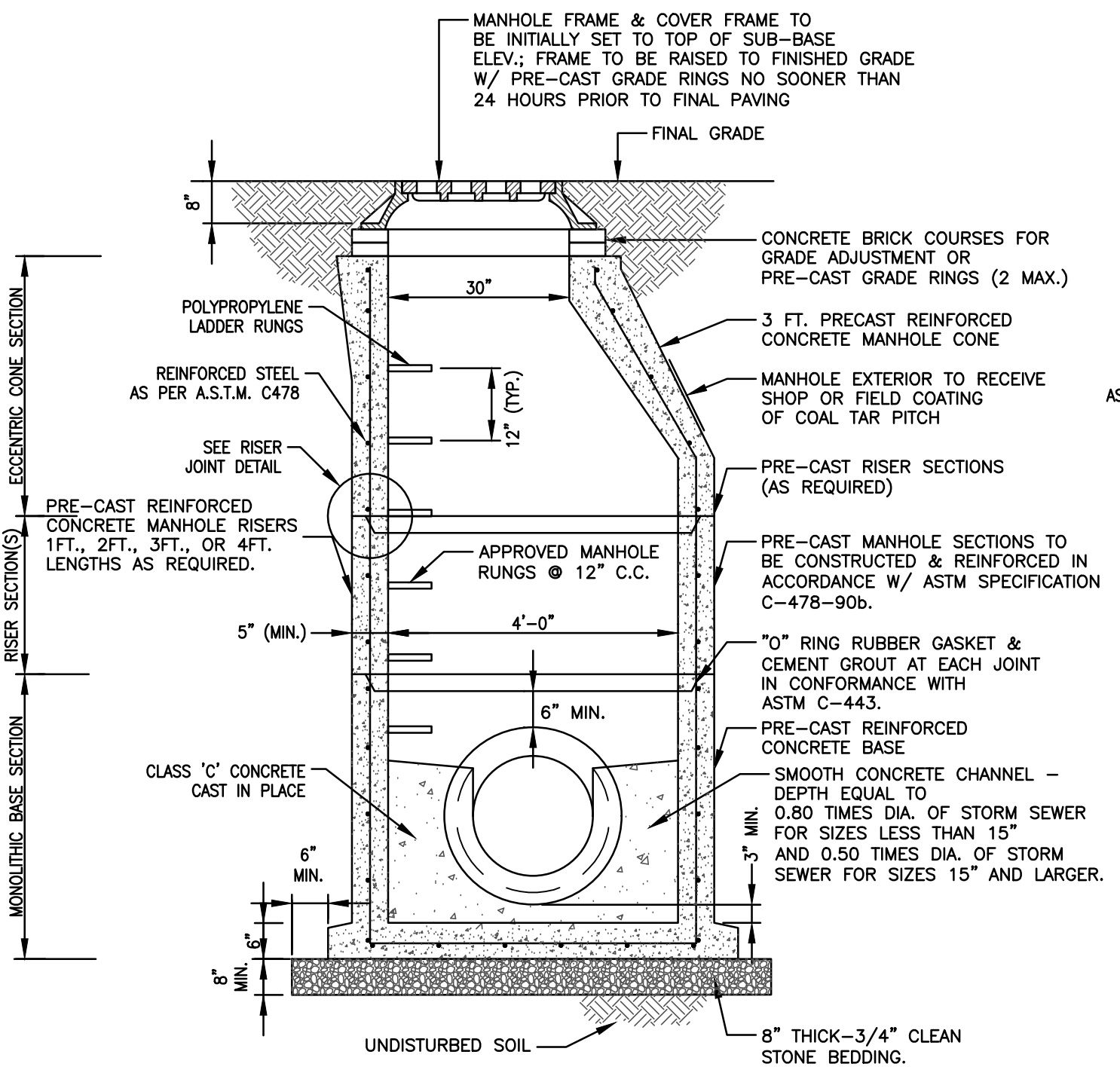
YARD INLET

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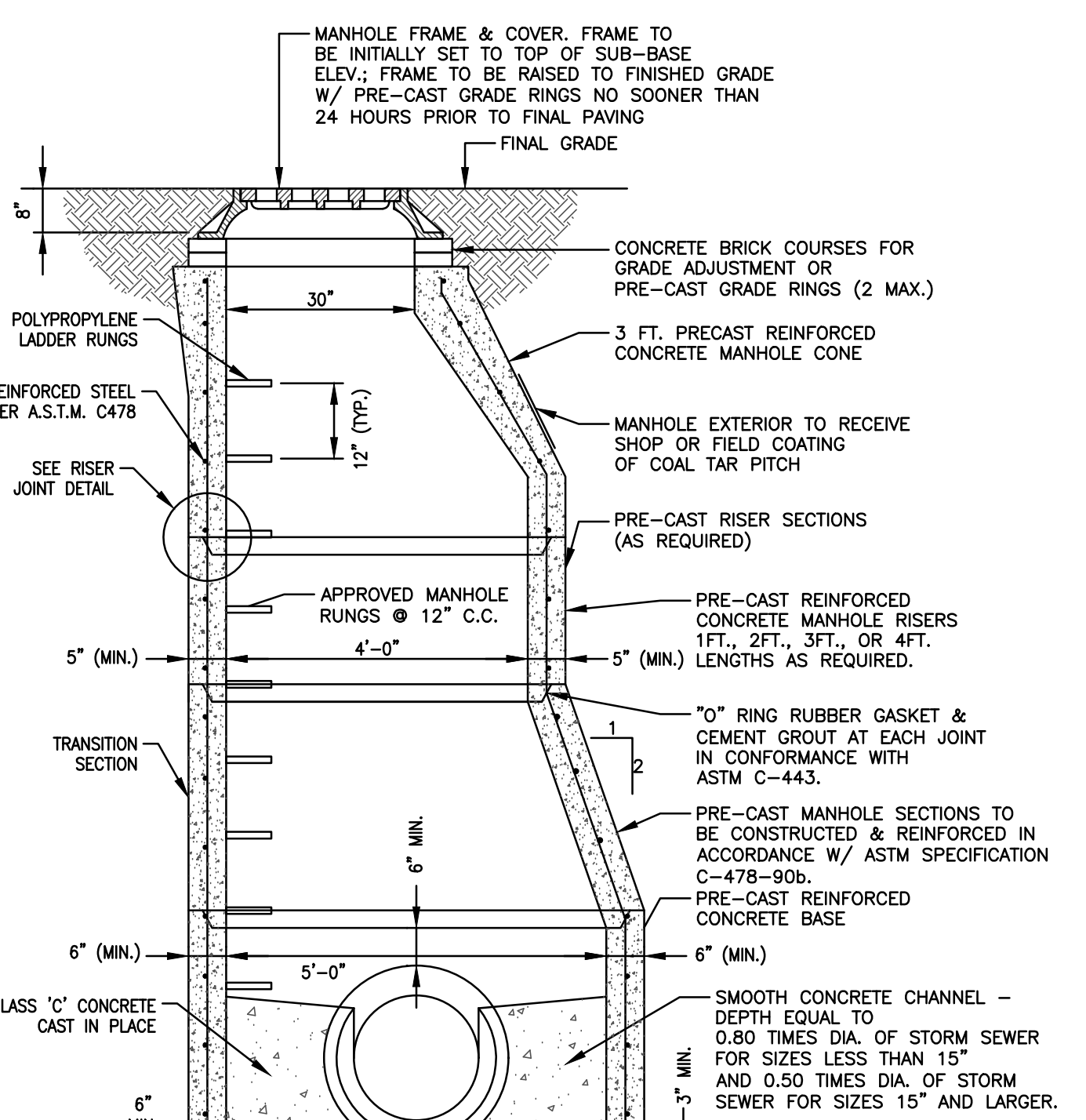
- ALL CASTINGS MUST INCLUDE "US-I" OR OTHER INDICATION OF U.S. MADE STEEL IN RAISED LETTERING AND ARE SUBJECT TO THE APPROVAL OF THE CITY ENGINEER PRIOR TO INSTALLATION.
- ALL INLET STEPS SHALL BE FABRICATED OF NON-SLIP ALUMINUM, STEEL, OR STEEL REINFORCED PLASTIC.
- CONTRACTOR SHALL BE RESPONSIBLE FOR CONSTRUCTING ADEQUATE BALLAST TO OFFSET FLOTATION FORCES ACTING ON INLETS INSTALLED IN WET AREAS.
- ALL REINFORCEMENT IS SUBJECT TO CITY ENGINEER APPROVAL BEFORE CONSTRUCTION. (BLOCK MANHOLE ONLY.)



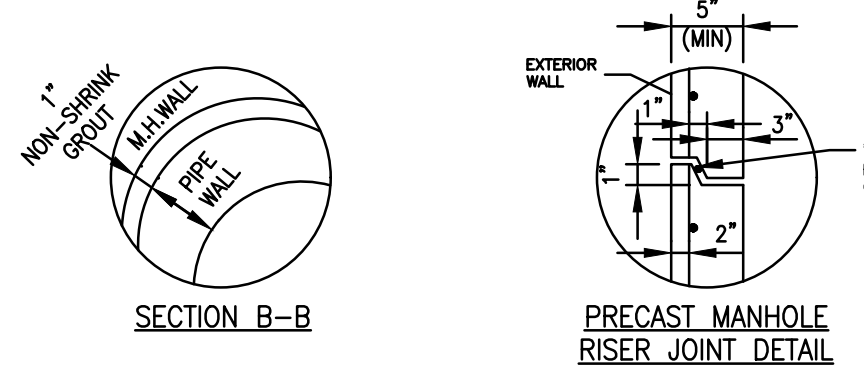
PLAN



MANHOLE 4'-0" DIAMETER

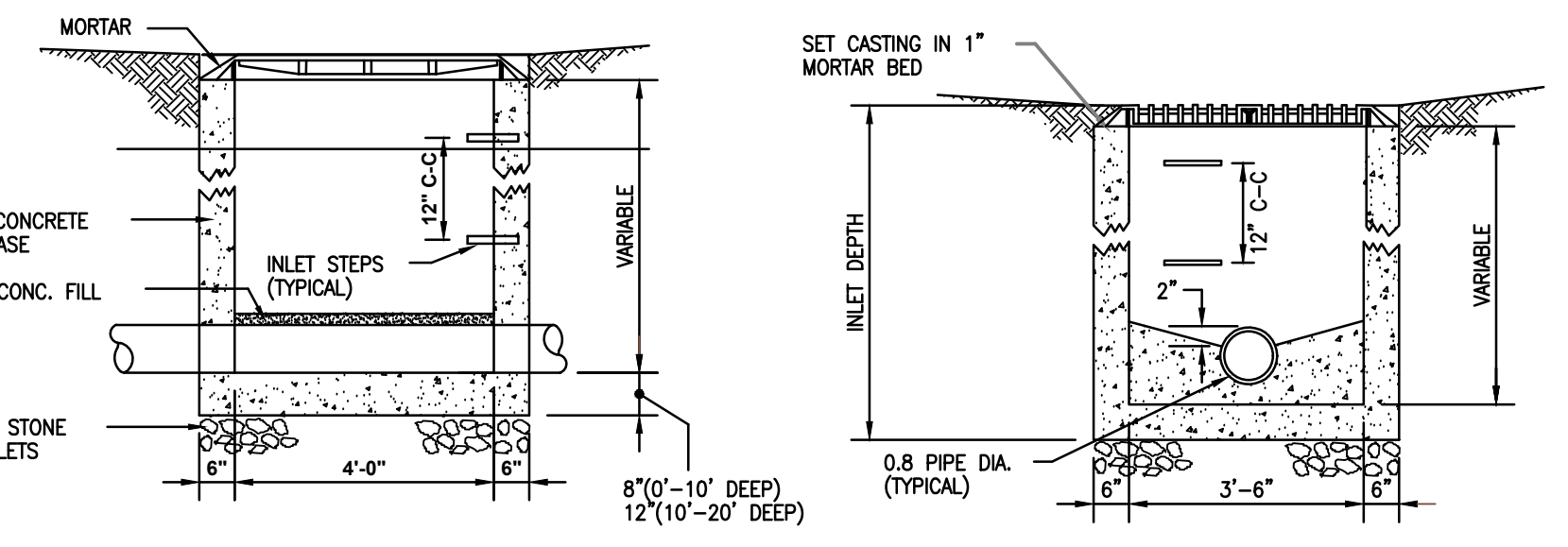


MANHOLE 5'-0" DIAMETER



STORM SEWER MANHOLE DETAIL

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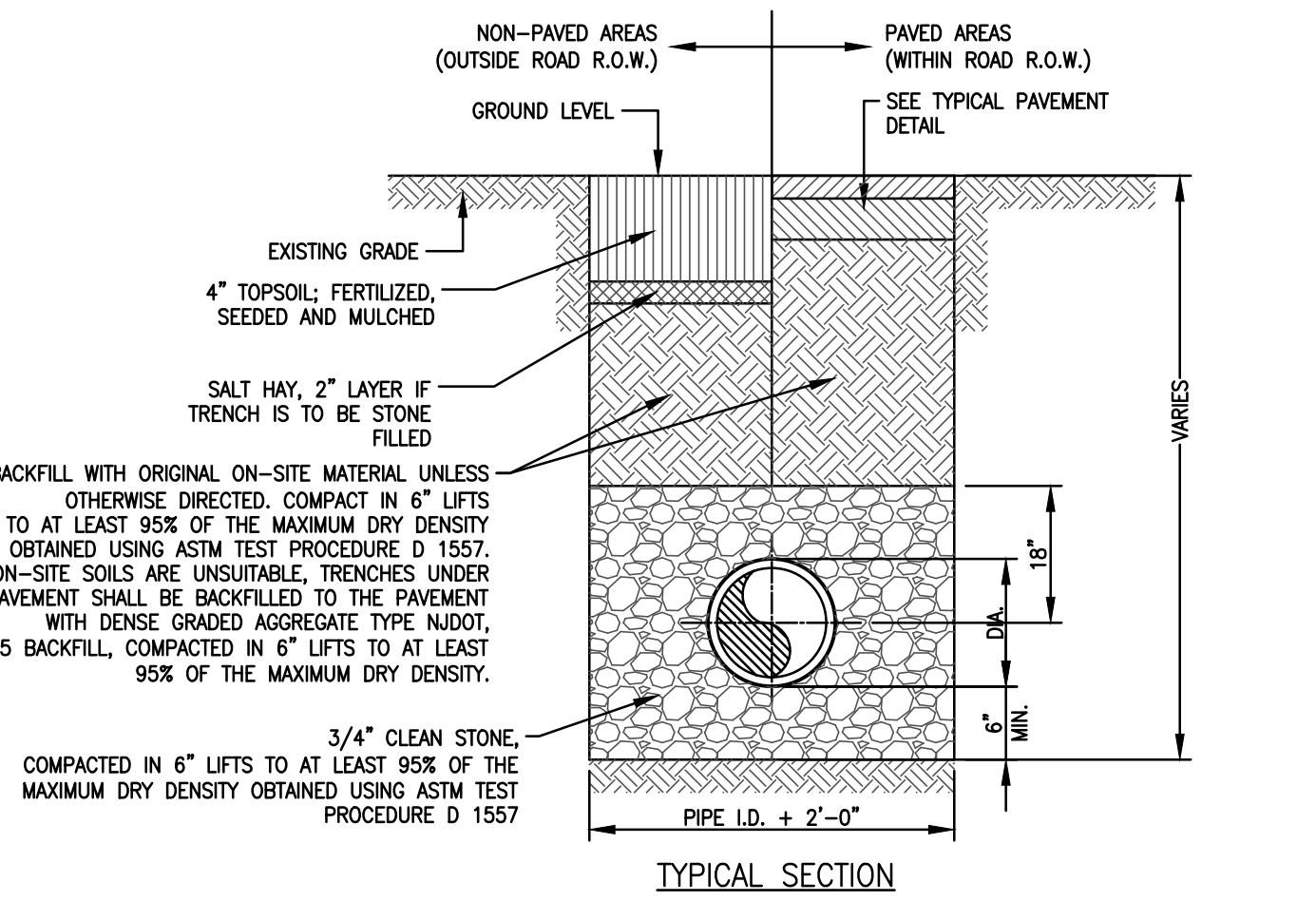


SECTION A-A

SECTION B-B

TYPE "E" INLET

N.T.S.



PVC TRENCH DETAIL

N.T.S.

SOIL EROSION AND SEDIMENT CONTROL DETAILS - 2

METLAR-BODINE HOUSE
BLOCK 12502 LOT 10.05

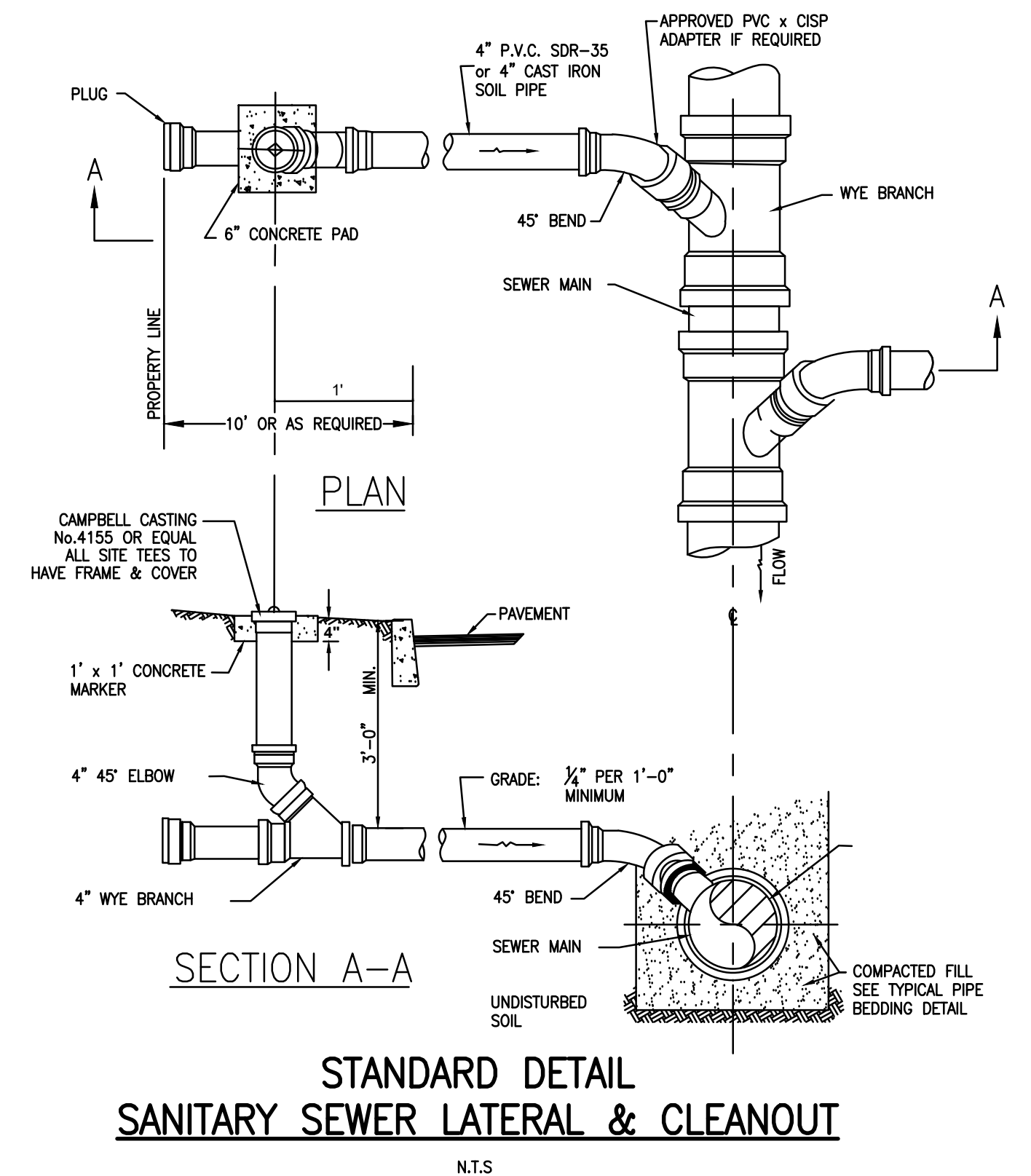
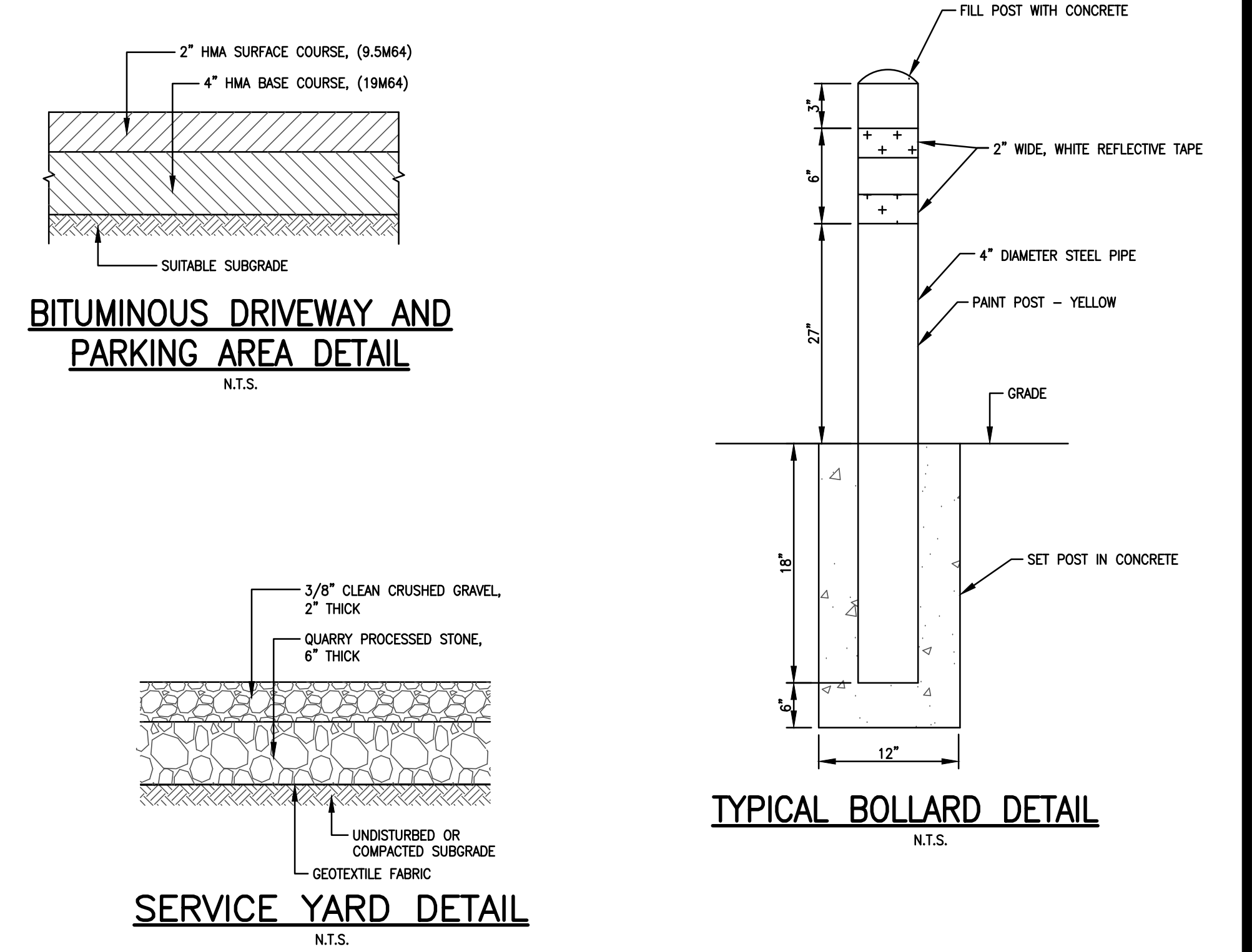
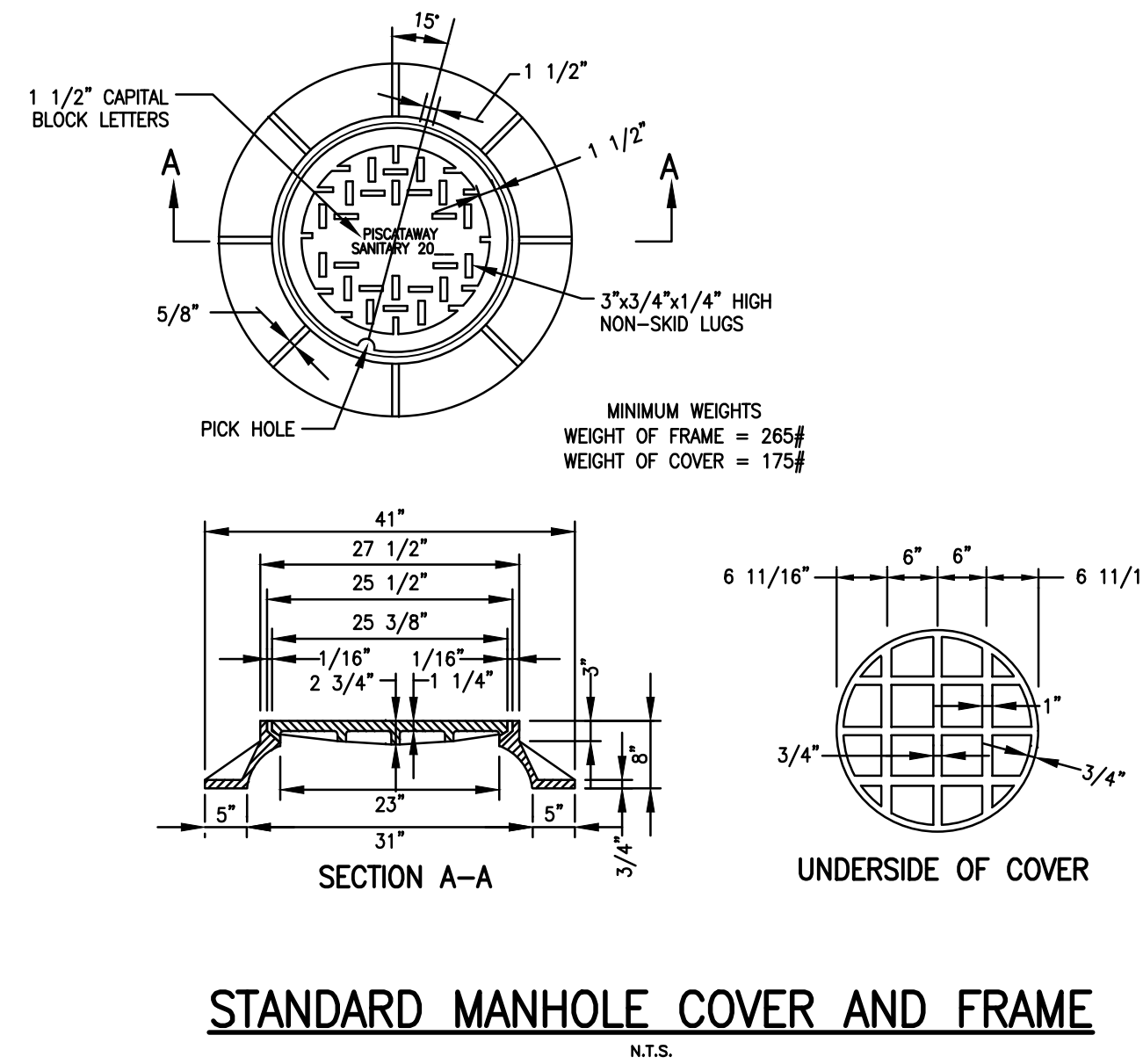
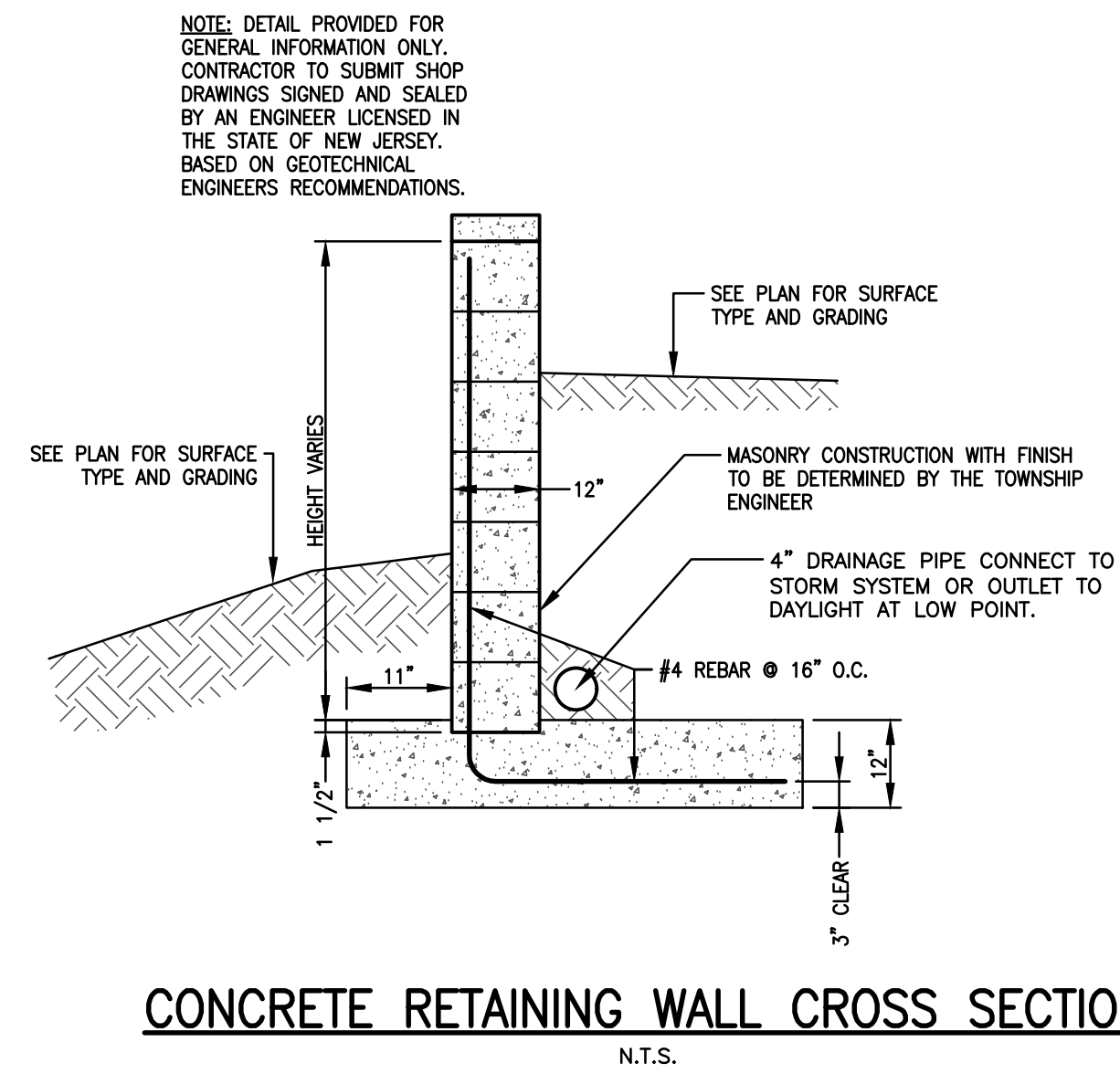
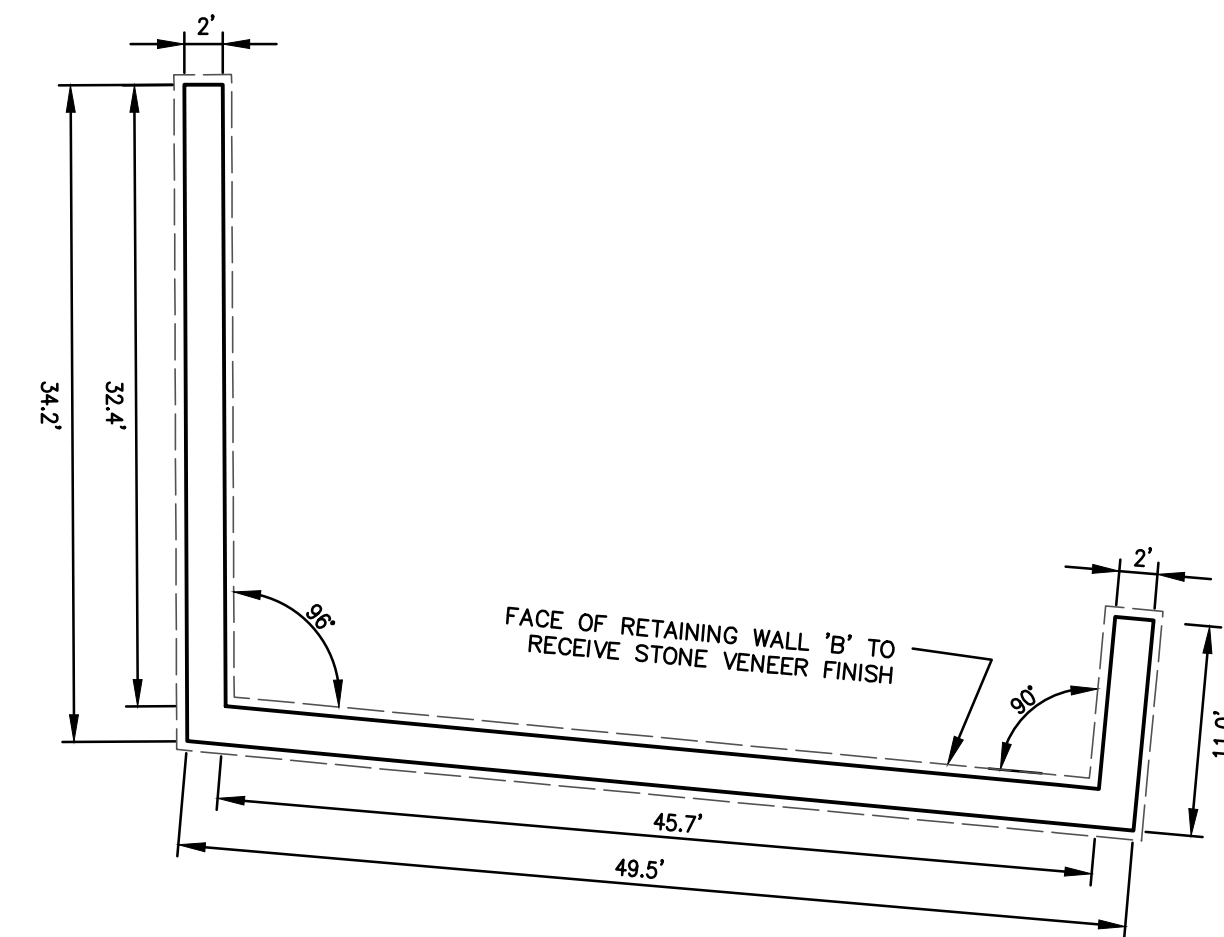
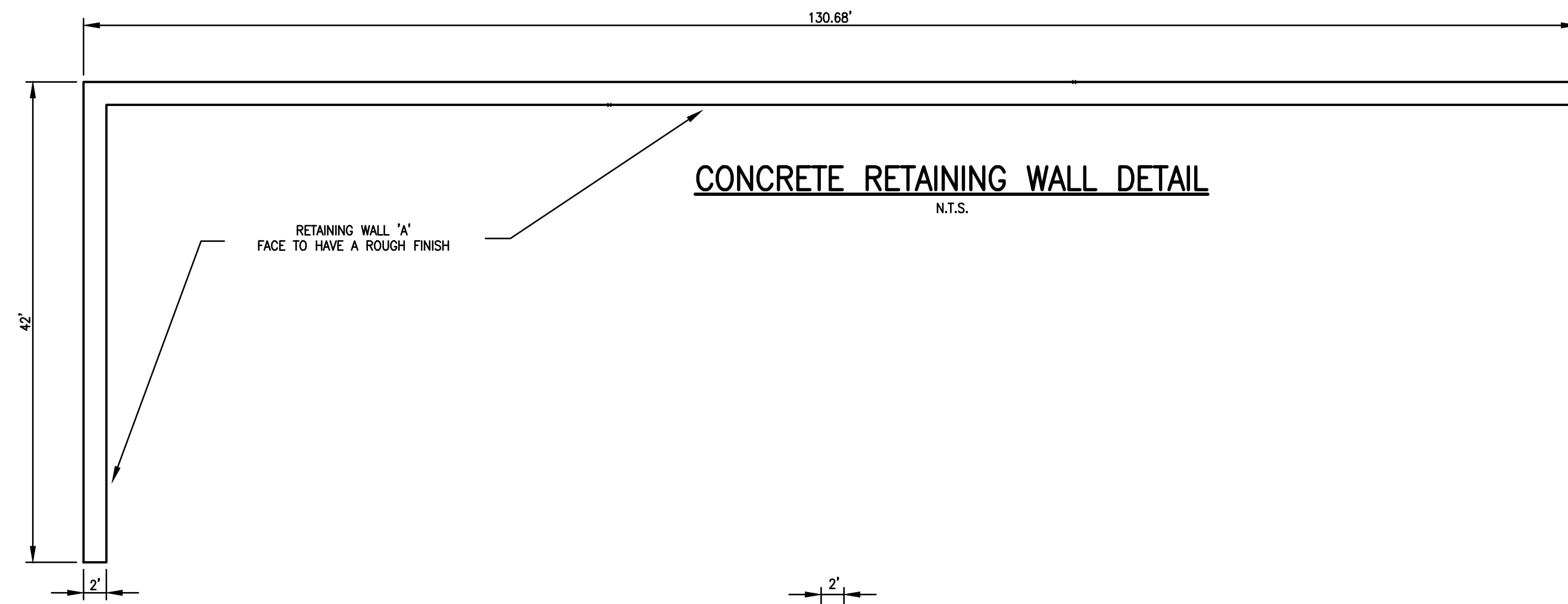
SITUATED IN
THE TOWNSHIP OF PISCATAWAY
MIDDLESEX COUNTY, NEW JERSEY

GROTTO ENGINEERING ASSOCIATES, LLC
ENGINEERS - PLANNERS - SURVEYORS
Certificate of Authorization No. 240A27919300
340 NORTH AVENUE
CRANFORD, NEW JERSEY 07016
908-272-8901 (F) 908-272-8902

FRANK W. FARRELL
PROFESSIONAL ENGINEER
N.J. LICENSE NO. 51556

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CONSTRUCTION DETAILS - 1

**METLAR-BODINE HOUSE
BLOCK 12502 LOT 10.05**

SITUATED IN
**THE TOWNSHIP OF PISCATAWAY
MIDDLESEX COUNTY, NEW JERSEY**

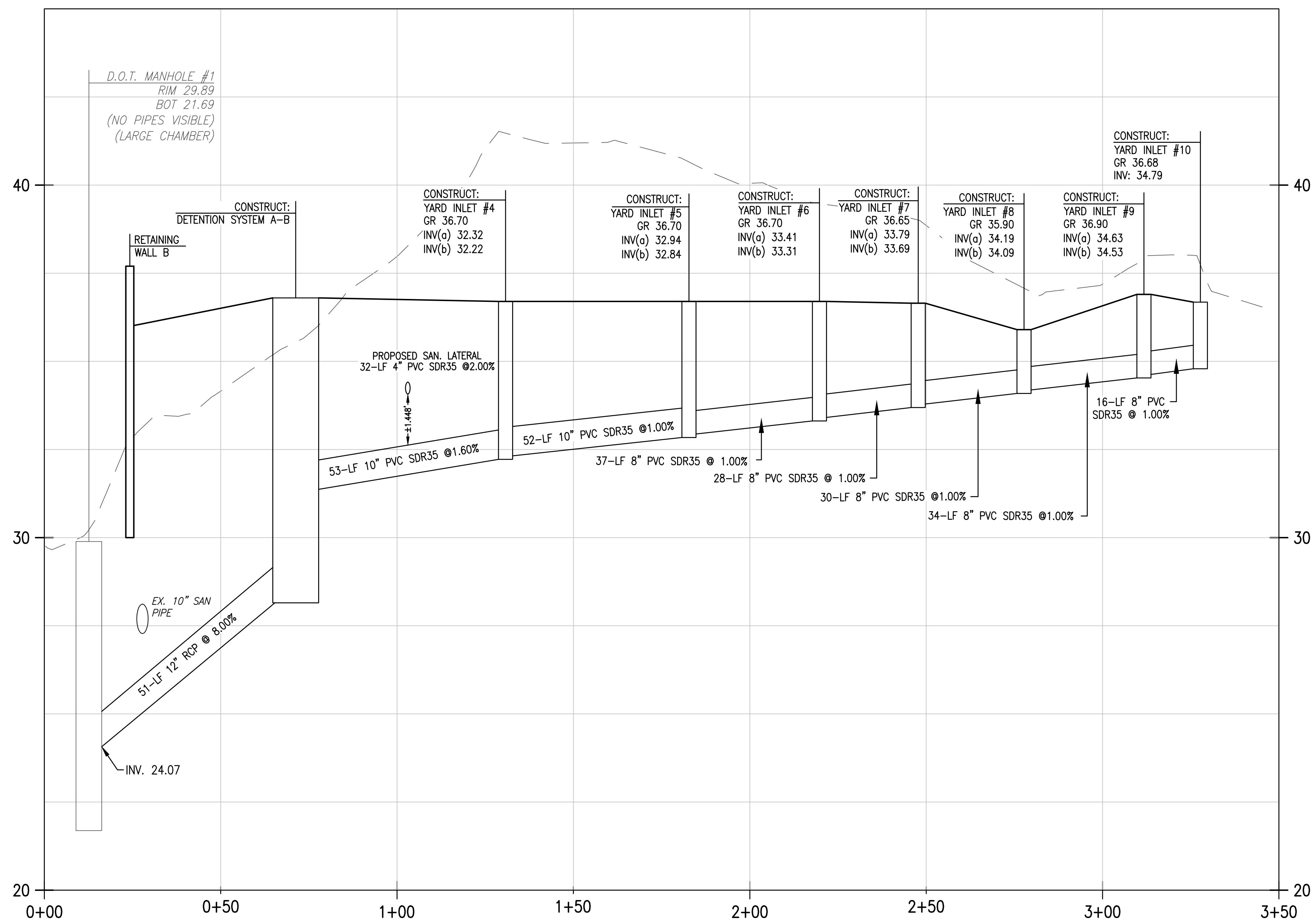
GROTTO ENGINEERING ASSOCIATES, LLC
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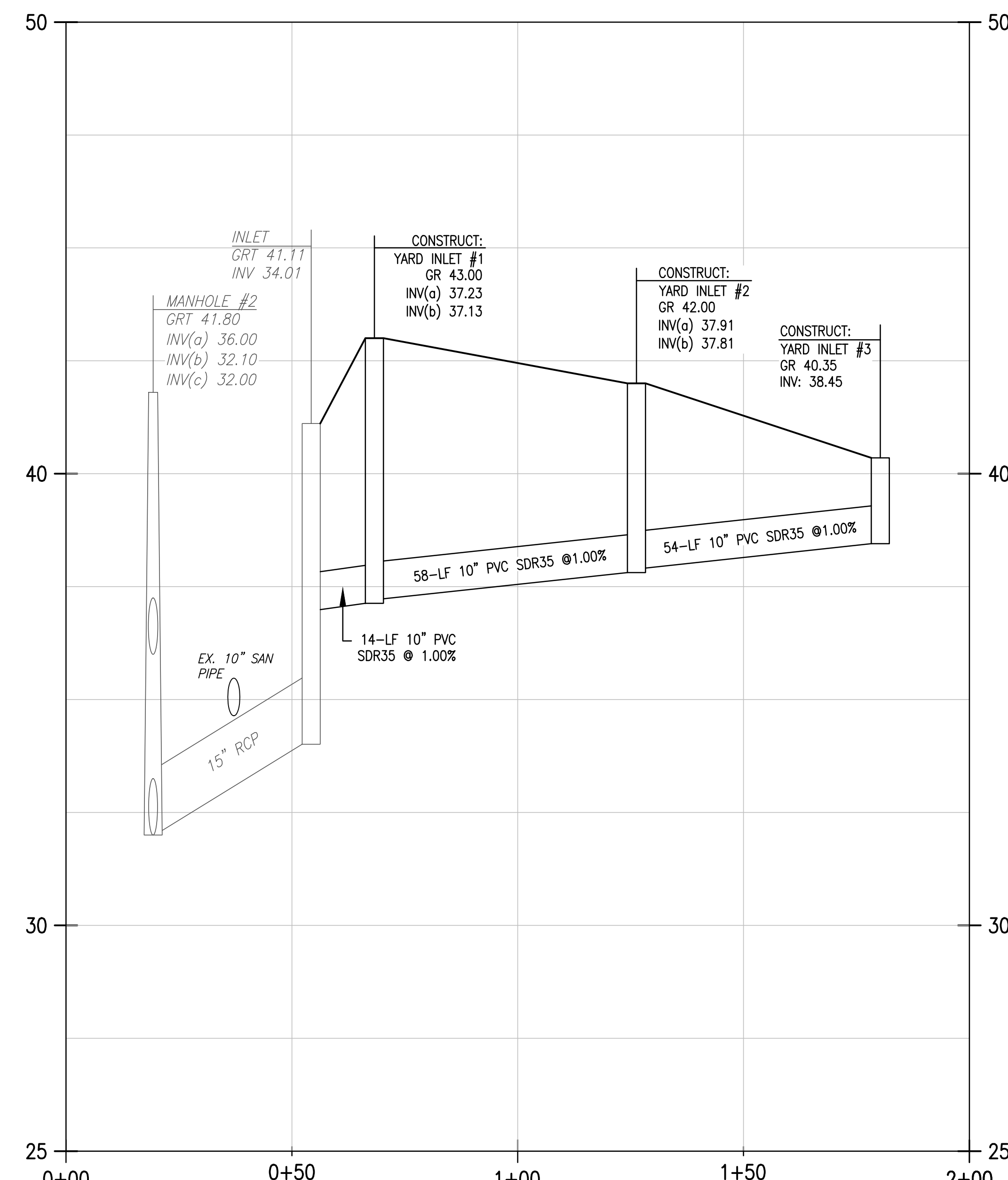
FRANK W. FARRELL PROFESSIONAL ENGINEER
N.J. LICENSE NO. 51556

DATE: 06-30-2021 | SCALE: | DRAWN: AJC | CHECKED: FF | SHEET: 8 OF 9 | JOB: PR-0234

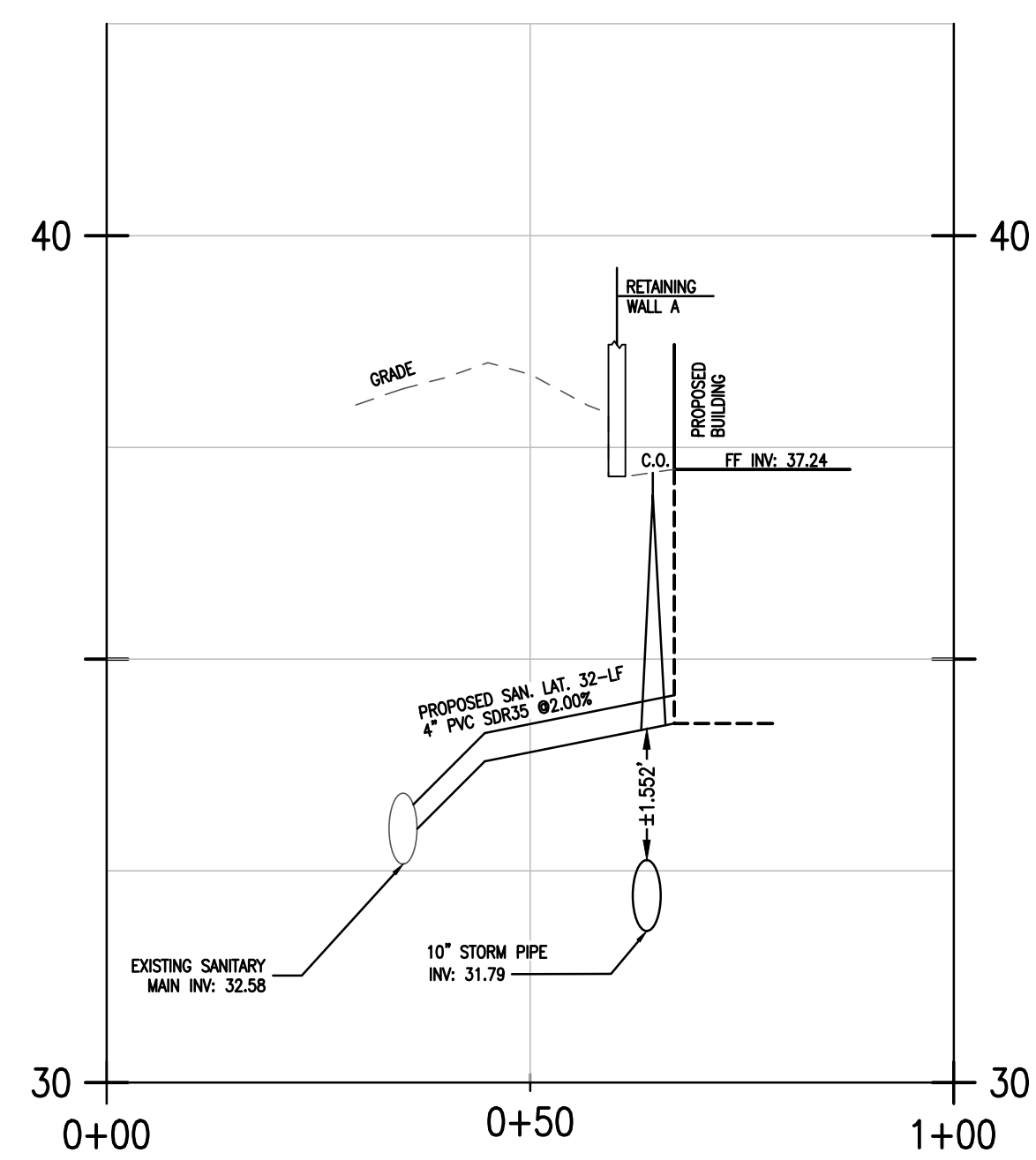
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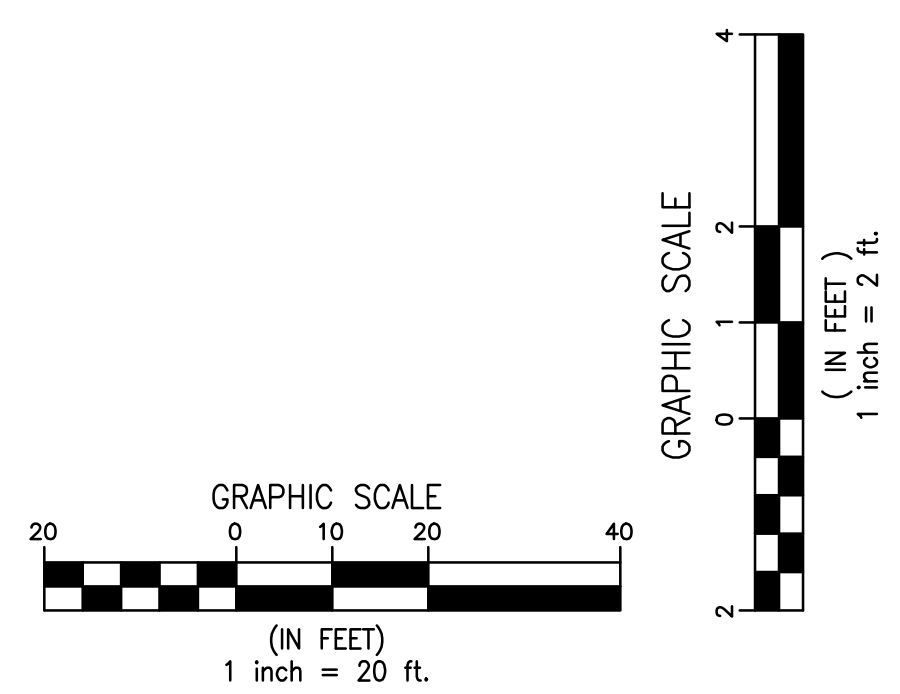
EX MH 1 TO STORM INLET 10



EX MH 2 TO STORM INLET 3



LATERAL PROFILE



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**METLAR-BODINE HOUSE
BLOCK 12502 LOT 10.05**

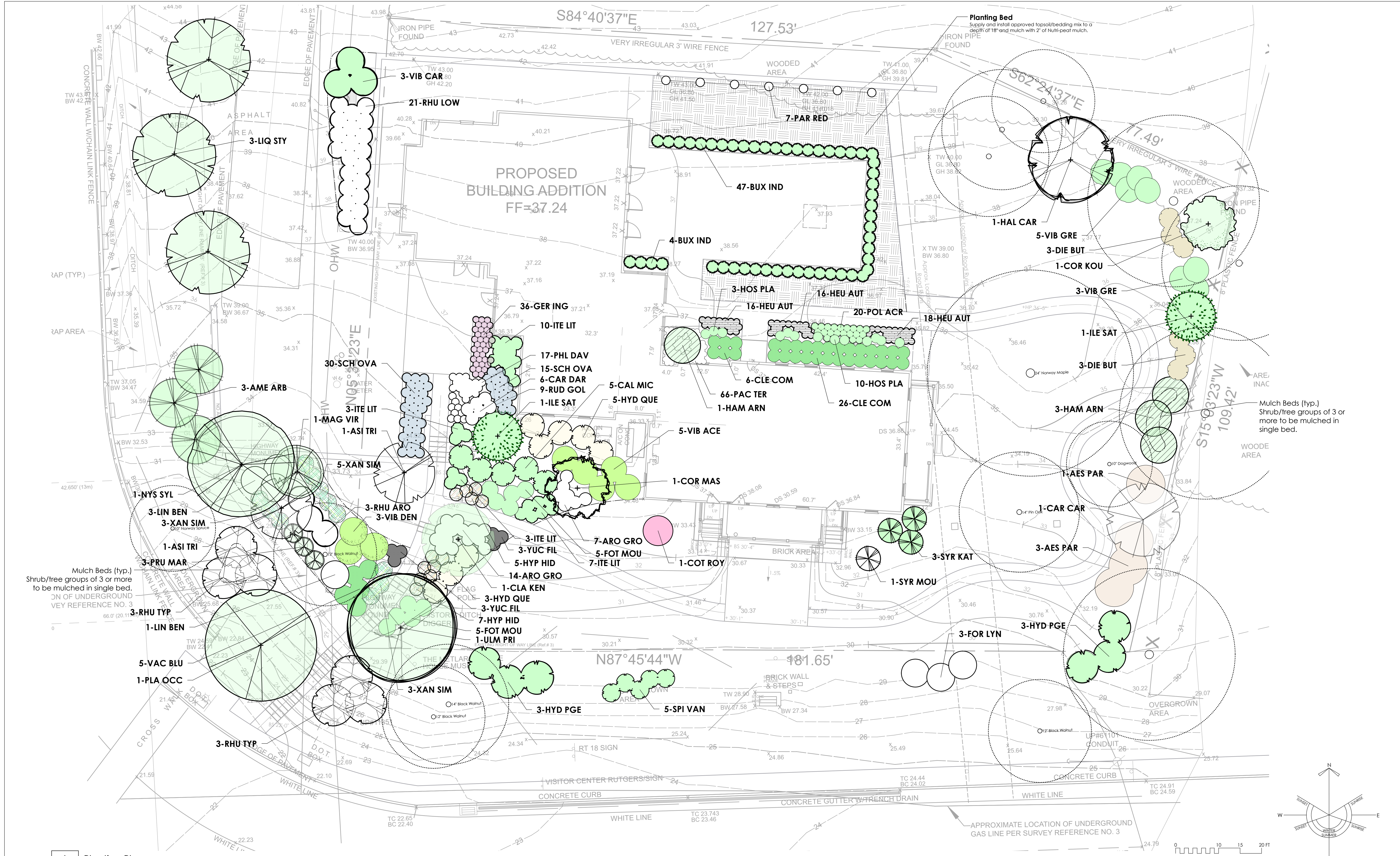
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908-272-8901 (F) 908-272-8902

FRANK W. FARRELL PROFESSIONAL ENGINEER
N.J. LICENSE NO. 51556

DATE: 06-30-2021 SCALE: 1"=20' DRAWN: AJC CHECKED: FF SHEET: 9 OF 9 JOB: PR-0234

S:\Grotto Projects\PR-0234 - Metlar-Bodine House (Conroy & Henry)\Sheets\Metlar-Bodine Site Plan C 6-30-2021.dwg 6/29/2021



1 Planting Plan
 Scale: 1" = 10'-0"

General Planting Notes:

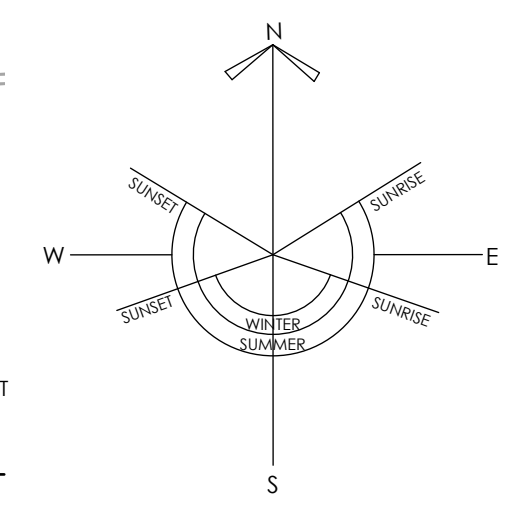
1. This plan is for planting purposes only.
2. If there is a discrepancy in quantity between the planting plan and planting schedule, the planting plan shall govern.
3. Written dimensions govern. Do not scale off drawing. Specifications govern drawing.
4. Contractor shall obtain and be responsible for all permits and inspections. All work shall be done in compliance with all applicable Federal, State, County, and local regulations and ordinances.
5. Contractor shall supply, install, and maintain erosion and sedimentation control measures as required. Contractor shall follow and meet regulations of the local Soil Conservation District.
6. The contractor shall thoroughly investigate all site conditions and take field measurements prior to the start of work. Field check all measurements, existing and proposed topography, and all existing dimensions on the site prior to the start of work.

Project Specific Planting Notes:

7. Contractor shall notify the landscape architect or owner of any discrepancy in the plans or specifications and obtain approval from the landscape architect or owner before proceeding with a modification/substitution to the plan.
8. Locate, determine the depth of, and be responsible for all underground utilities prior to the start of work/construction. Utility markouts must be completed in accordance with the regulations of the governing utility markout organization. The contractor is responsible for all repairs to any underground or overhead utility damaged by him or his subcontractor(s) during construction.
9. Contractor shall protect lawns, meadows, plantings, shrubs, trees, and/or building from construction damage. Do not park equipment or stockpile materials on lawns, meadows, plantings or within the root zone/drip line areas of trees. Tree protection fencing shall be provided around all existing trees to be saved that are within the work zone. Contractor is responsible for the repair of any damage outside of the work area.

Planting Bed

1. Plant Sizes: Herbaceous/perennials/grasses-actual quantity shown. If landscape plug sizes used as specified, round up to nearest flat quantity. If larger sizes are used, provide quantity specified.
2. All disturbed areas within the project area that are not paved or planted shall be reseeded per the specifications.



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 PROJECT NO.: 1836C
 DATE: 30 JUNE 2021
 REVISIONS:

DRAWN BY: BAP

**RESTORATION & EXPANSION
 HISTORIC METLAR-BODINE HOUSE**
 TOWNSHIP OF PISCATAWAY
 MIDDLESEX COUNTY, NEW JERSEY

JOHN MORGAN THOMAS
 LANDSCAPE ARCHITECTS, P.C.
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John Morgan Thomas
 NJ LLA # AS00698

L1

PLANTING SPECIFICATIONS

- 1.01 GENERAL**
- FART 1 Scope of Work**
- A. Plants and planting: trees, shrubs perennials, annuals and groundcover.
 - B. Lawns: seeding and/or sodding
- 1.02 References and Quality Control**
- A. All planting material shall conform to the latest edition of the American Standard for Nursery Stock (ANSI Z60.1-1990) as published by the American Association of Nurserymen.
 - B. All plants shall be nursery grown within a U.S.D.A. plant hardiness zone which is the same as, or colder than, the zone in which the project is located.
 - C. Substitutions: Plants have been selected carefully based on design consideration such as color, texture, site, etc. as well as appropriate to site environmental conditions as we understand them. The landscape contractor may make recommendations for substitutions, based upon personal knowledge and experience, if the proposed substitutions are better suited to the conditions on the site, or more resistant to local disease or insect problems; provided that the proposed substitutions are aesthetically and functionally equivalent as determined by the landscape architect. While substitutions based on availability may be considered, the contractor must make a good faith effort to procure the material specified well in advance of installation and the landscape architect reserves the right to identify sources if substitutions are proposed based on a lack of availability.
 - D. Size: Provide trees and shrubs of sizes shown or specified. Trees and shrubs of larger size may be used if acceptable to the landscape architect.
 - E. Inspection: Landscape architect reserves the right to inspect trees and shrubs either at place of growth (i.e. large trees) or at site before planting for compliance with requirements for name, variety, size and quality. Landscape architect has right to reject any plant material for any reason. All rejected plant material shall be immediately removed from the site. The landscape architect may require the use of specimen plants to be pre-logged at the nursery, as shown on the plans or the instructions to bidders.
 - F. Soil Test: Soil test shall be Rutgers Type Topsoil Analysis or equivalent, conducted on the soil native to the site as well as any imported topsoil. Test results and recommendations for fertilizer requirements shall be submitted to the Landscape Architect (1.03.D.1).

- 1.03 Submittals**
- A. Landscape Architect reserves the right to require submittals for all products used on the project.
 - B. Acceptance of submittals will be presented to the contractor by the landscape architect in writing. Work may not proceed on the project until this written authorization is received.
 - C. Plant List: Contractor shall submit final plant list for review and approval by landscape architect prior to installation. Plant lists shall include substitutions if proposed. Location of growers may be required, as well as provenance of native plant material if specified on the plans or instructions to bidders.
 - D. Other required submittals include:
 - Certificates of Conformance or Compliance:
 - 1. All soil test results, including recommendations for fertilizer, to be submitted to landscape architect prior to delivery and spreading of topsoil.
 - 2. Plant material labels, indicating plants to be installed are true to type specified; to be submitted to landscape architect prior to commencement of planting operations.
 - 3. A written certification for fertilizer and lime, indicating manufacturer's chemical analysis; to be submitted to landscape architect prior to delivery and spreading.
 - 4. A written certification from seed and soil, indicating ratio of species in the blend and age/date of packaging of seed; to be submitted to landscape architect prior to any sodding or seeding operations.

- 1.04 Guarantee:**
- A. Trees, shrubs, perennials, groundcovers and lawn shall be guaranteed for one year from date of acceptance by the owner or his representative. The one exception to this one-year warranty will be if the contractor chooses to complete the planting when the plant materials are dormant (i.e. late October) the warranty shall be extended to the subsequent spring following the expiration of the one year time period. The landscape architect will then conduct the final inspection as soon as feasible possible that spring to determine plant mortality. The plants are to be alive and in satisfactory growing condition as determined by the owner or his representative at the end of the guarantee period.
 - B. Replacement will be made according to these same specifications and during the normal planting period. Replacements shall be subject to the same guarantee and replacement as the original material. The replacements shall be made within 60 days following written demand from the township.
 - C. During the warranty period, the contractor shall:
 - 1. Periodically inspect the plants throughout the growing season to ensure proper establishment is taking place.
 - 2. Provide the owner with a written list of maintenance items necessary to ensure survival of the newly installed plant material. Contractor may (at his option) prepare a separate maintenance contract to the owner for review, which would provide for advanced and more extensive care of the new plantings during the warranty period. Owner reserves the right to accept or reject this maintenance proposal.
 - 3. Notify the owner in writing if items on the maintenance list are being neglected, as well as specific remedial options/tasks that would correct the situation.
 - D. In case of any questions regarding the conditions and satisfactory establishment of a rejected plant, the contractor may, if approved by the owner, allow such a plant to remain through another growing season of which time the rejected plant, if found to be dead, or in an unhealthy or badly impaired condition, shall be replaced.
 - E. The contractor is not responsible for theft or damage to plants by non-contractor vehicles or vandalism once plants are installed and approved by the owner or his representative.
 - F. The warranty period shall be terminated after the landscape architect conducts a final inspection at the end of the one year period/the one complete growing season, and determines that all plantings are alive and in satisfactory condition. The landscape architect will certify in writing that the contractor is free from any outstanding obligations related to the project at that time, provided the preceding conditions have been met. The contractor shall not be relieved from the responsibilities outlined in the warranty until this final written certification is received.

- 2.01 PRODUCTS**
- 2.01 Plants**
- A. All plants shall be in accordance with the American Standard for Nursery Stock, ANSI Z60.1 (most current edition). Sizes supplied by the contractor shall conform to the measurements designated in the plant list. Container-grown plants that are either excessively root-bound or newly potted such that adequate roots have not yet developed) will be rejected.
- 2.02 Mulch**
- A. Nutri-Peat Mulch as supplied by Country Mile Gardens, Morristown Gardens, or approved equal.
 - B. Premium hardwood bark. Minimum 75% bark, 25% virgin hardwood, lipe shredded. Material shall be uniform in size and free of foreign matter and weed seeds.
- 2.03 Organic Matter [One of the following]**
- A. Premium Mushroom Compost with gypsum as supplied by: USA Gypsum or approved equal.
 - B. Recycled composted leaf mulch.
 - C. Manufactured recycled composted sewage sludge; contents and chemical analysis certified by manufacturer (provide documentation).
 - D. Type 1 Sphagnum peat moss; finely divided with a PH of 3.1 - 5.0.
 - E. Other equivalent organic matter as approved by landscape architect.
- 2.04 Topsoil**
- A. Material shall be a friable agricultural loam from a well-drained site, representative of productive soils in the vicinity. Topsoil shall be capable of producing satisfactory agricultural crops, free from clay lumps, subsoil, sticks, stones and other foreign materials. UNSCREENED topsoil shall be used, with foreign materials as described above being mechanically removed at the time of spreading. Topsoil pH value shall be not less than 5.0 or greater than 7.5, and shall contain a minimum of 4% organic matter. Topsoil shall not be delivered in a muddy or frozen condition.
- 2.05 Bedding mix/Planting mix**
- A. A thorough mixture of 2 parts topsoil, 2 parts organic matter (excludes sewage sludge option), and 1 part sharp ungraded sand, or approved equal.
- 2.06 Staking and guying materials**
- A. C 10 gauge pilable metal wire; double reinforced rubber hose; brightly colored surveyors ribbon; 2" x 2" hardwood or cedar stakes with one end pointed.
- 2.07 Fertilizer**
- A. Shall meet test requirements for state in which project is located. Analysis of fertilizer shall be dependent upon reports and recommendations of the soil test.
- 2.08 Lime**
- A. In accordance with soil tests, lime shall be high magnesium ground limestone containing not less than 85% total carbonates, 95% passing a 20-mesh sieve, 40% passing a 60-mesh sieve, and a minimum of 30% passing a 100-mesh sieve.
- 2.09 Seed Mixture**
- A. Grass Seed: Shall be clean and fresh, packed in sealed bags showing net weight, composition of mix, date of germination test, and supplier name. Germination test must be done within a nine-month period prior to sale of this seed.
 - 1. Turf-Type Tall Fescue; contents of mixture to be certified by manufacturer. Germination tests must be done within a nine-month period prior to sale of the seed. Seed mixture shall be a blend of 3 different varieties of Turf-Type Tall Fescue, totaling 90% of the total mixture, plus 10% Kentucky Blue Grass. Mixture shall not contain more than 0.5% weed seed, no more than 3% inert matter, and no other crop or undesirable grass species.
 - 2. Alternative or additional seed mixes that are used if specified on plans or instructions to bidders.

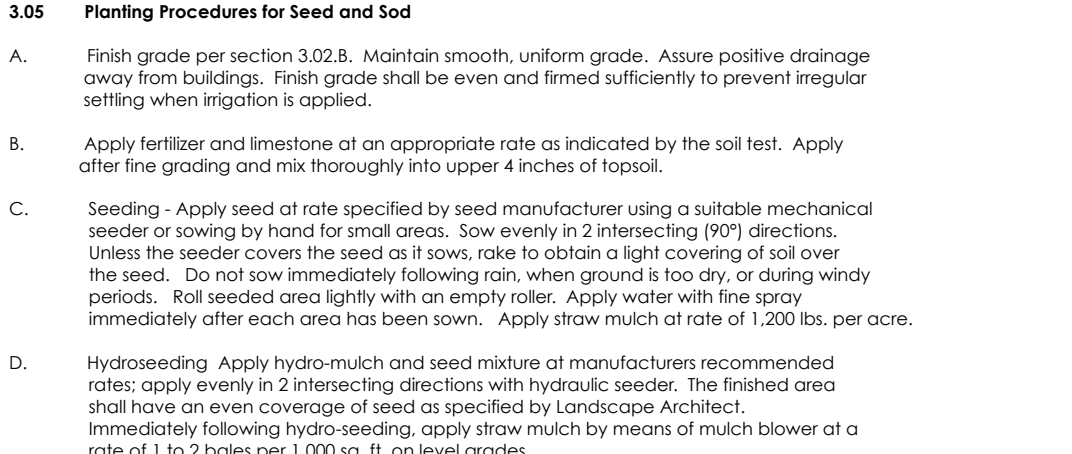
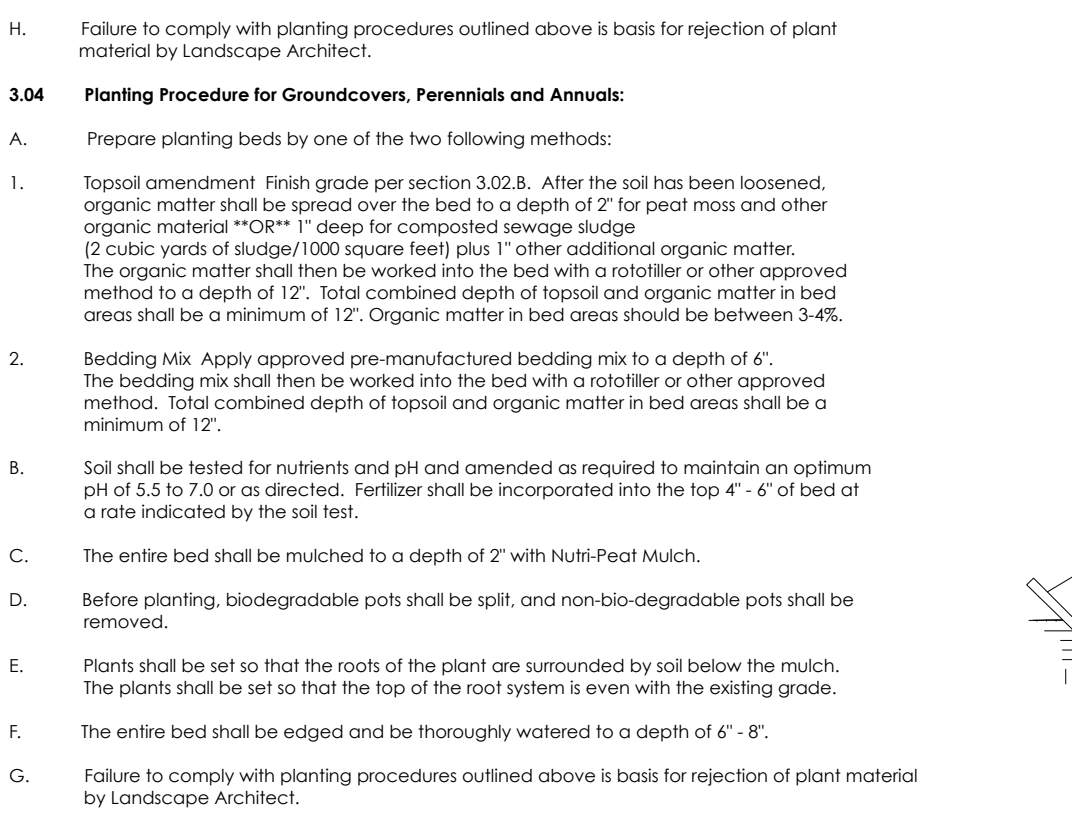
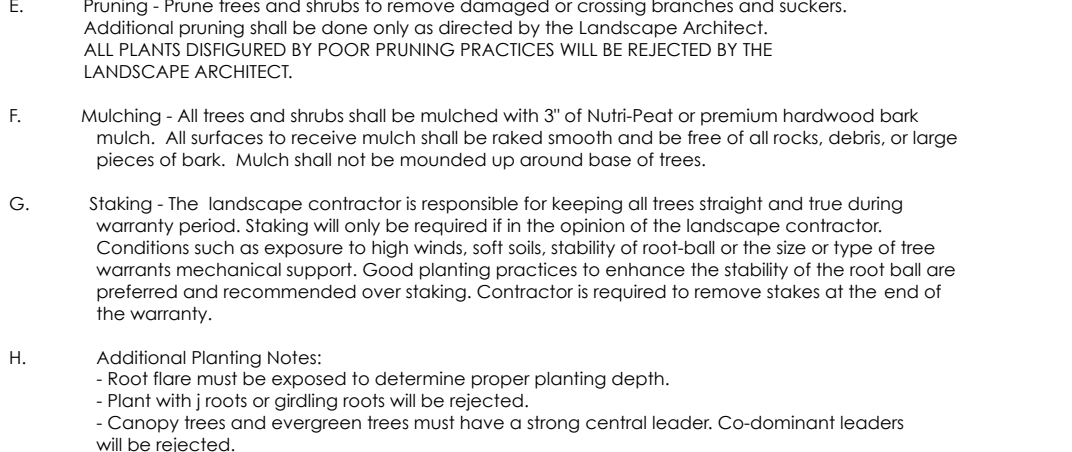
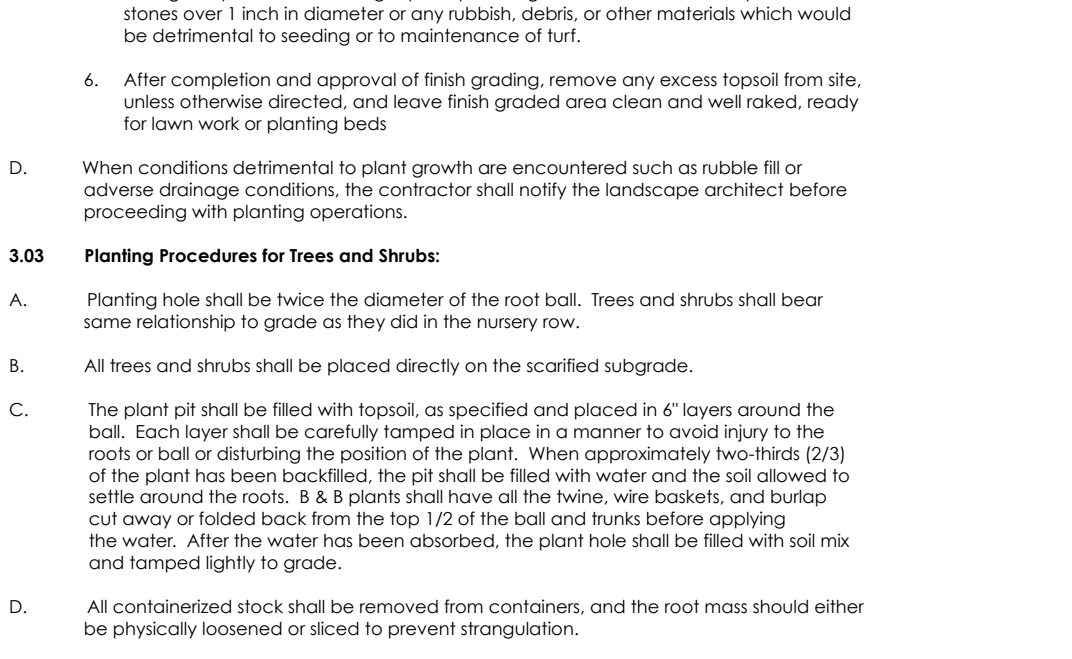
- 2.10 Sod**
- A. Certified field cultivated grass sod; with strong fibrous root system and free from stones and burned or bare spots. Sod shall be a blend of 3 different varieties of turf-type tall fescue, totaling 90% of the total mixture, plus 10% Kentucky Blue Grass. Sod shall be free of any other foreign, undesirable grass species.
- 2.11 Show mulch**
- A. Out or wheel straw, reasonably free from weeds, foreign matter detrimental to plant life, and in dry condition. Hay or chopped cornstalks is not acceptable.
- 2.12 Establishment Blanket**
- A. Degradable, non-woven matting such as Futuroth or other approved equivalent erosion control product, installed per manufacturer's specifications.
- 2.13 EXECUTION**
- 3.01 Planting and Turf Installation Seasons and Conditions:**
- A. Perform planting operations within the following dates: from April 1st to May 31st for spring and from September 1st to October 31st for fall. The contractor may request that planting occur outside of these dates provided the request is made in writing, and contains the reasons why planting is occurring outside of the normal planting season. Fall planting is preferred and highly recommended.
 - B. No work shall be done when the ground is frozen, snow covered, too wet or in an otherwise unsuitable condition for planting. Special conditions may exist that warrant a variance in these conditions the contractor shall submit a written request to the landscape architect stating the special conditions and proposed variations.
 - C. Final planting schedule is subject to approval by the owner and his representative.
- 3.02 Soil Excavation and Preparation:**
- A. Contractor is responsible for location of site utilities. Damage to utility lines will be repaired at the contractor's expense.
 - B. Contractor is responsible for minimizing soil compaction on the site. This includes staying within the defined limits of disturbance, keeping construction vehicles and excavating equipment off the site when soil is wet or during the winter months when the soil is not frozen. No construction should be done until after a minimum of 24 hours after a significant rain event (1" or greater).
 - C. Finish Grading:
 - 1. Perform all finish grading necessary to bring site to required finished elevations. Finish grading shall consist of preparing subgrade and spreading topsoil ready for planting work. Use the topsoil stockpiled on the site during earthwork operations and provide any additional topsoil required.
 - 2. Subgrade Preparation -
 - Compacted Subgrade: For areas with significant compaction, subsoil plowing shall be done where there is evidence of compaction of greater than 6" depth. Subsoiling shall be done with modern agricultural sub-soilers or rippers with narrow straight shanks and coulters designed for minimal disturbance. Alternate methods using machinery such as a backhoe to be approved by landscape architect.
 - Uncompacted Subgrade: Loosen top 6" of subgrade by harrowing, disking, or dragging, depending on conditions and amount of compaction present.
 - Final Subgrade Preparation: The entire subgrade shall then be raked, and all stones over 1 1/2 inches, grade stakes, rubbish, and general debris shall be removed.
 - 3. Contractor shall make every feasible effort to minimize disturbance beneath canopies of existing mature trees. Bed and lawn areas beneath existing trees shall be top-dressed with 1" of organic matter only. No rototilling or other deep soil disturbances may occur beneath the drip line of existing tree canopies. If tree protection fencing from other construction operations is encroaching areas to be planted, it may be carefully removed by the contractor.
 - 4. Topsoil shall be dumped in piles, uniformly spaced or otherwise distributed by approved equipment. The piles shall be spread to a minimum depth of 6 inches to permit 1 inch of settlement. Correct any surface irregularities to prevent formation of low spots and pockets that would retain water.
 - 5. Topsoil shall not be placed when the subgrade is frozen, excessively wet, or extremely dry, and no topsoil shall be handled when in a frozen or muddy condition. During all operations following topsoil spreading, the surface shall be kept free from stones over 1 inch in diameter or any rubbish, debris or other materials which would be detrimental to seeding or to maintenance of turf.
 - 6. After completion and approval of finish grading, remove any excess topsoil from site, unless otherwise directed, and leave finish graded area clean and well raked, ready for lawn work or planting beds.

- 3.03 Planting Procedures for Trees and Shrubs:**
- A. Planting hole shall be twice the diameter of the root ball. Trees and shrubs shall bear same relationship to grade as they did in the nursery row.
 - B. All trees and shrubs shall be placed directly on the scarified subgrade.
 - C. The plant pit shall be filled with topsoil, as specified and placed in 6" layers around the ball. Each layer shall be carefully tamped in place in a manner to avoid injury to the roots or ball or disturbing the position of the plant. When approximately two-thirds (2/3) of the plant has been backfilled, the pit shall be filled with water and the soil allowed to settle around the roots. B & B plants shall have all the twin wire baskets, and burlap cut away or labled back from the top 1/2 of the ball and trunk before applying the water. After the water has been absorbed, the plant hole shall be filled with soil mix and tamped to grade.
 - D. All containerized stock shall be removed from containers, and the root mass should either be physically loosened or sliced to prevent strangulation.
 - E. Pruning - Prune trees and shrubs to remove damaged or crossing branches and suckers. Additional pruning shall be done only as directed by the Landscape Architect. ALL PLANTS DAMAGED BY POOR PRUNING PRACTICES WILL BE REJECTED BY THE LANDSCAPE ARCHITECT.
 - F. Mulching - All trees and shrubs shall be mulched with 3" of Nutri-Peat Mulch or premium hardwood bark mulch. All surfaces to receive mulch shall be raked smooth and be free of rocks, debris, or large pieces of bark. Mulch shall not be mounded up around base of trees.
 - G. Staking - The landscape contractor is responsible for keeping all trees straight and true during warranty period. Staking will only be required if in the opinion of the landscape contractor conditions such as exposure to high winds, soft soil, stability of root ball or the size or type of tree warrants mechanical support. Good planting practices to enhance the stability of the root ball are preferred and recommended over staking. Contractor is required to remove stakes at the end of the warranty.
 - H. Additional Planting Notes:
 - Root flare must be exposed to determine proper planting depth.
 - Plant with roots or grading roots will be rejected.
 - Canopy trees and evergreen trees must have a strong central leader. Co-dominant leaders will be rejected.
 - I. Failure to comply with planting procedures outlined above is basis for rejection of plant material by Landscape Architect.

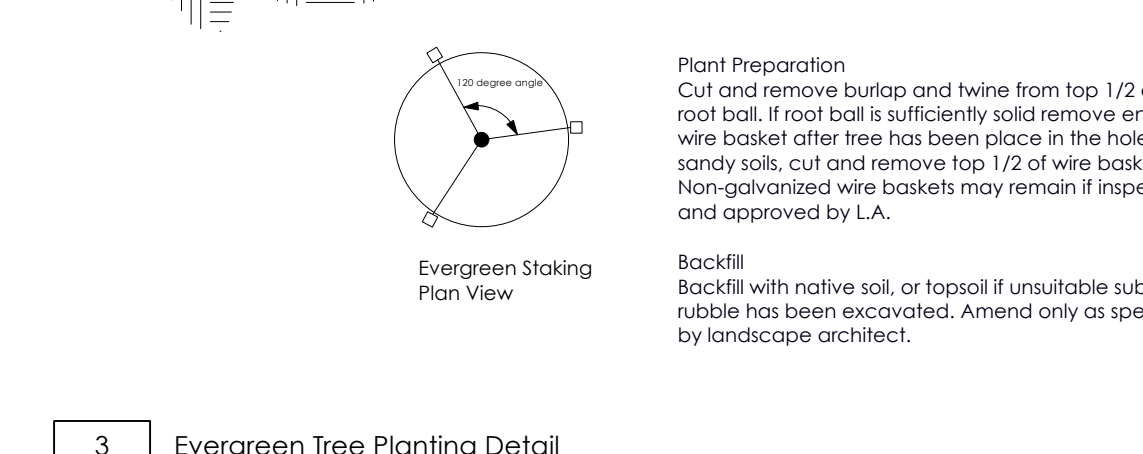
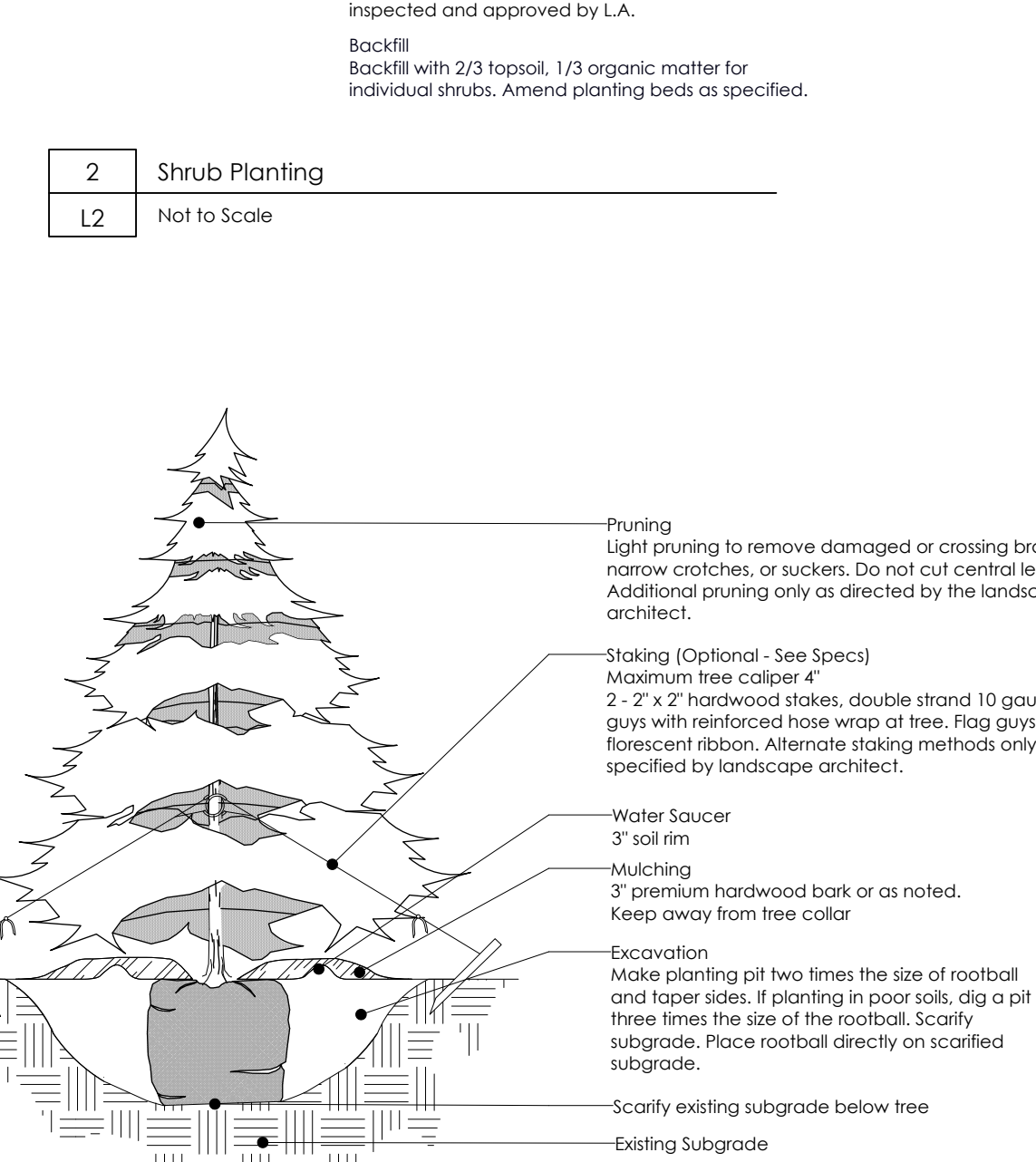
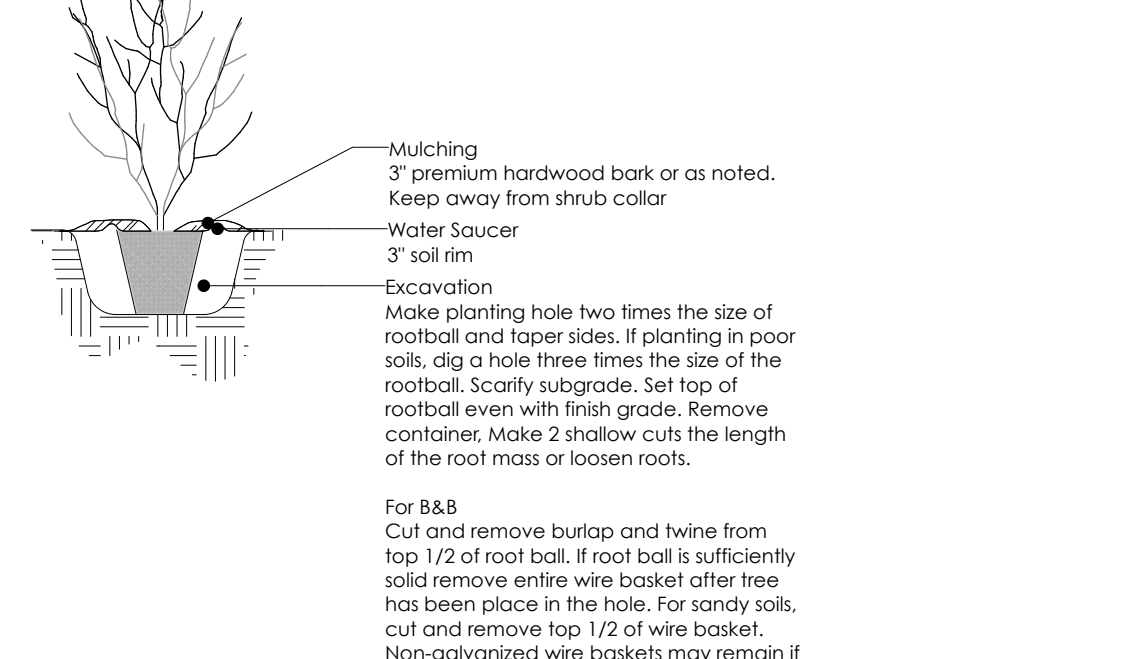
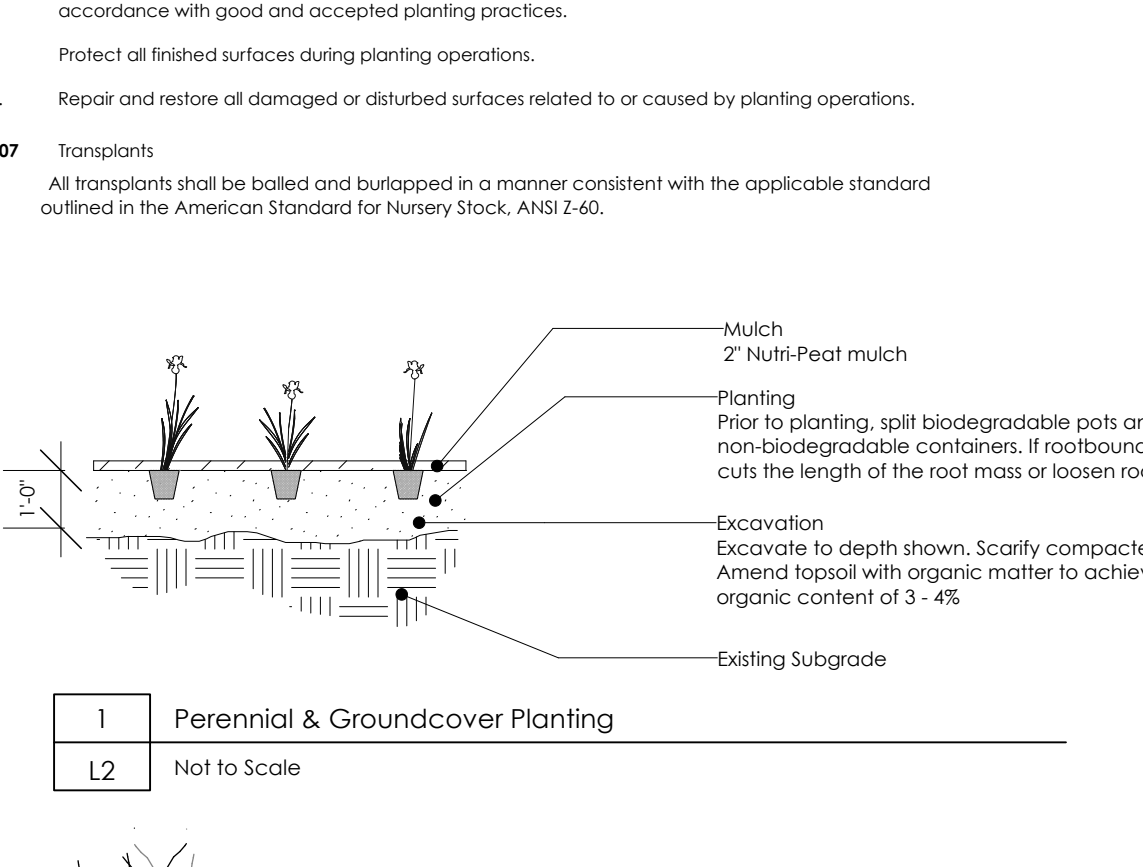
- 3.04 Planting Procedure for Groundcovers, Perennials and Annuals:**
- A. Prepare planting beds by one of the two following methods:
 - 1. Topsoil amendment: Finish grade per section 3.02.B. After the soil has been loosened, organic matter shall be spread over the bed to a depth of 2" for peat moss and other organic material *MOM* 1" deep for composted sewage sludge (2 cubic yards of sludge/1000 square feet) plus 1" other additional organic matter. The organic matter shall then be worked into the bed with a rototiller or other approved method to a depth of 12". Total combined depth of topsoil and organic matter in bed areas shall be a minimum of 12".
 - 2. Bedding Mix: Apply approved pre-manufactured bedding mix to a depth of 6". The bedding mix shall then be worked into the bed with a rototiller or other approved method. Total combined depth of topsoil and organic matter in bed areas shall be a minimum of 12".
 - B. Soil shall be tested for nutrients and pH and amended as required to maintain an optimum pH of 5.5 to 7.0 or as directed. Fertilizer shall be incorporated into the top 4" - 6" of bed at a rate indicated by the soil test.
 - C. The entire bed shall be mulched to a depth of 2" with Nutri-Peat Mulch.
 - D. Before planting, biodegradable pots shall be split, and non-bio-degradable pots shall be removed.
 - E. Plants shall be set so that the roots of the plant are surrounded by soil below the mulch. The plants shall be set so that the top of the root system is even with the existing grade.
 - F. The entire bed shall be edged and be thoroughly watered to a depth of 6" - 8".
 - G. Failure to comply with planting procedures outlined above is basis for rejection of plant material by Landscape Architect.
- 3.05 Planting Procedures for Seed and Sod**
- A. Finish grade per section 3.02.B. Maintain smooth, uniform grade. Assure positive drainage away from buildings. Finish grade shall be even and finished sufficiently to prevent irregular settling when irrigation is applied.
 - B. Apply fertilizer and limestone at an appropriate rate as indicated by the soil test. Apply after fine grading and mix thoroughly into upper 4 inches of topsoil.
 - C. Seeding - Apply seed of a type specified by seed manufacturer using a suitable mechanical seeder or sowing by hand in small areas. Sow evenly in 2 intersecting (90°) directions. Unless the seeder covers the seed as it sows, rake to obtain a light covering of soil over the seed. Do not sow immediately following rain, when ground is too dry, or during windy periods. Roll seeded area lightly with an entrench roller. Apply water with fine spray immediately after each area has been sown. Apply straw mulch at rate of 1,200 lbs. per acre.
 - D. Hydroseeding: Apply hydro-mulch and seed mixture at manufacturer's recommended rates; apply evenly in 2 intersecting directions with hydraulic seeder. The finished area shall have an even coverage of seed as specified by Landscape Architect. Immediately following hydro-seeding, apply straw mulch by means of mulch blower at a rate of 1 to 2 bales per 1,000 sq. ft. on level grades.

- E. Seed Bed Protection - Cover seeded slopes with Establishment Blanket (2.12), installed per manufacturer's specifications, when the following conditions exist:
 - 1. Slopes greater than or equal to 3:1
 - 2. Bottom of weed/ease fabric in a continuous slip through bottom of swales; no open joints; downhill sections shall be placed to overlap the preceding uphill section.
 - 3. If seeding is approved outside of the normal planting season under the provisions outlined in section 3.01, all seeded areas on the site will receive establishment blanket.
- F. Laying Sod - Lay sod as soon as possible after delivery to prevent deterioration. Lay sod pieces closely together with no open joints visible and pieces not overlapped. Lay smooth and flush with adjoining grass areas paving and top surfaces of curbs. On slopes 3:1 and steeper, lay sod perpendicular to slope and secure every row with sod stakes of maximum 2 feet on center. Drive stakes flush with soil portion of sod. Immediately water sodded areas after installation, in sufficient amounts to saturate sod and upper 4 inches of soil. After sod and soil has dried sufficiently to prevent damage, roll sodded areas completely with hand roller.
- G. Maintenance - Seeded and sodded lawn areas shall be maintained for a period of 30 days beyond the date of first cutting, during which time the following practices shall be employed to ensure the establishment of a healthy and acceptable stand of grass. Maintenance practices shall include: maintain smooth surface and supply additional topsoil as necessary; water to ensure germination and to maintain ideal soil moisture for growth; immediately re-seed or re-sod any damaged or deteriorated areas; control growth of weeds; and cut grass to maintain minimum height of 2 1/2" - 3". First cutting shall occur when grass reaches 3 1/2" - 4" in height. All exposed joints between sod pieces shall be filled with top soil and seeded.
- H. Acceptance - Seeded areas will be accepted at the end of the maintenance period if seeded areas are properly established and otherwise acceptable. Sodded areas will be accepted at the end of the maintenance period if the sod has rooted and is otherwise acceptable.
- I. Failure to comply with planting procedures outlined above is basis for rejection of plant material by Landscape Architect.

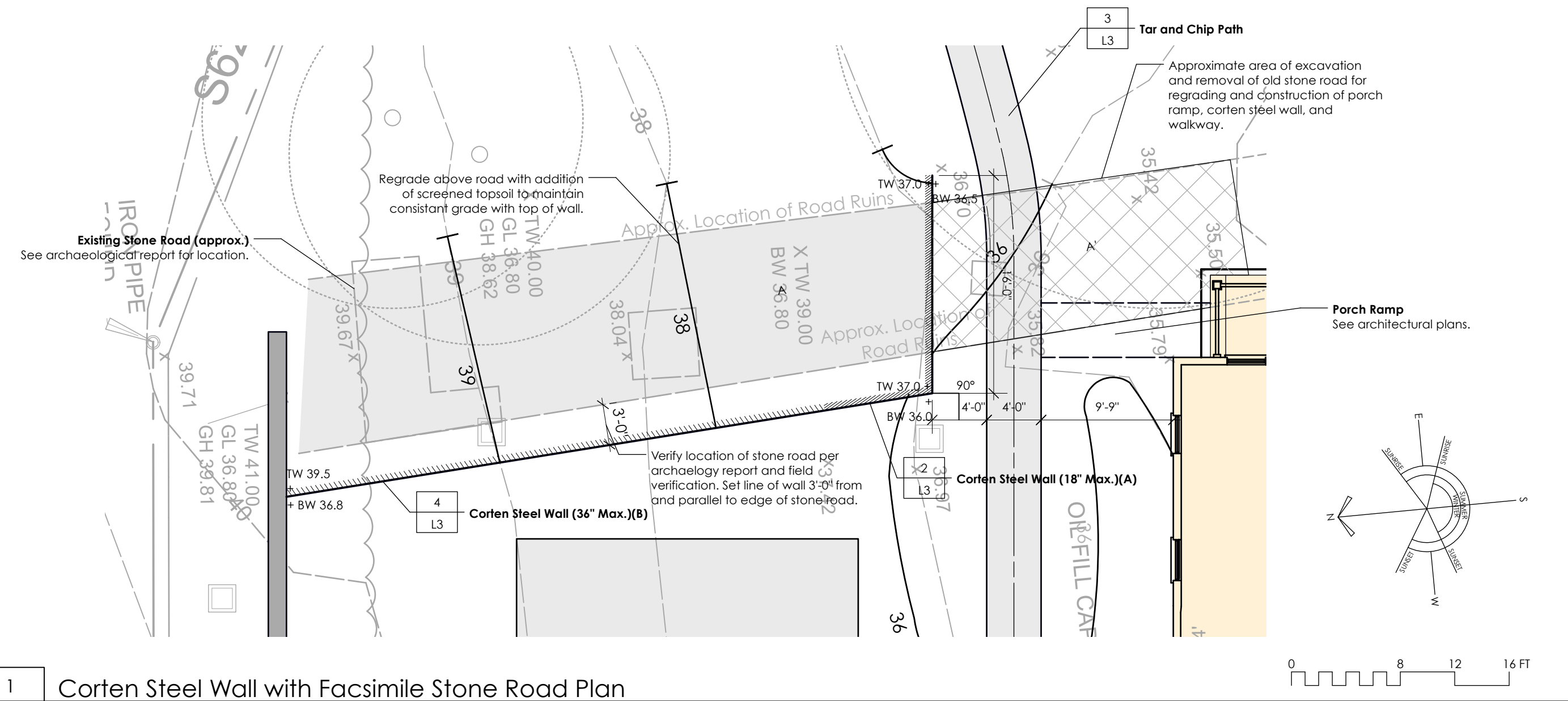
- 3.06 Removal and Clean-up:**
- A. Removal of debris is required. The property must be left in a neat and orderly condition in accordance with good and accepted planting practices.
 - B. Protect all finished surfaces during planting operations.
 - C. Repair and restore all damaged or disturbed surfaces related to or caused by planting operations.
- 3.07 Transplants:**
- All transplants shall be balled and burlapped in a manner consistent with the applicable standard outlined in the American Standard for Nursery Stock, ANSI Z60.



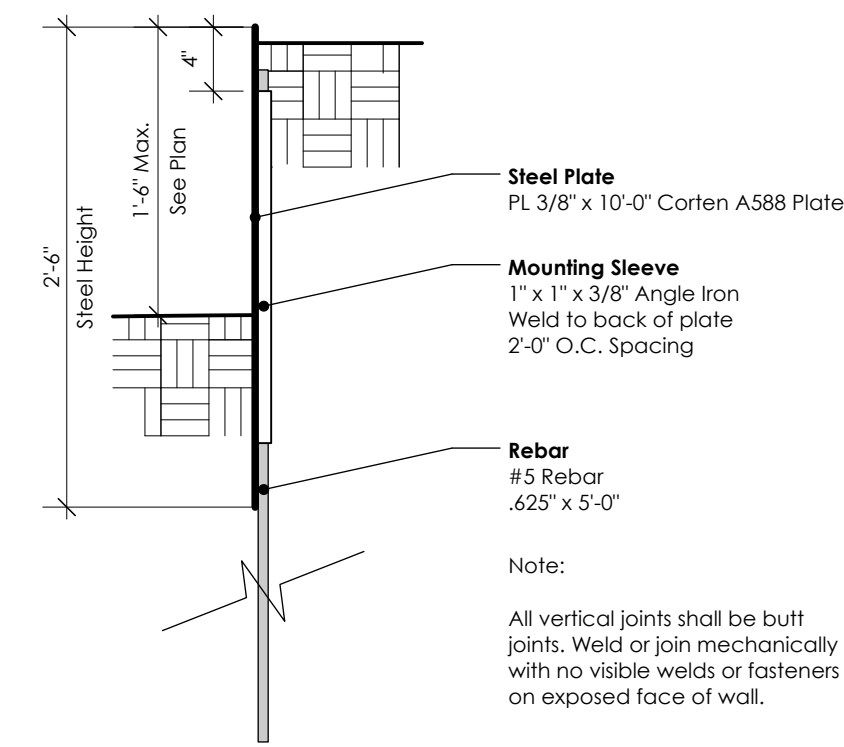
| PLANT SCHEDULE | | Latin Name | Common Name | Size | Spacing | Remarks |
|--------------------------------------|----------|--|--|--------------|-------------|-----------|
| Symbol | Quantity | | | | | |
| Canopy Trees | | | | | | |
| LIQ STY | 3 | Liquidambar styraciflua | American Sweetgum | 2-2 1/2' B&B | 24'-0" O.C. | |
| NYS SYL | 1 | Nyssa sylvatica | Black Gum, Tupelo | 2-2 1/2' B&B | | |
| PLA OCC | 1 | Platanus occidentalis | Sycamore | 2-2 1/2' B&B | | |
| ULM FRI | 1 | Ulmus americana 'Pincetone' | Princeton Elm | 2-2 1/2' B&B | | |
| Total: 6 | | | | | | |
| Evergreen Trees | | | | | | |
| ILE SAT | 2 | Ilex opaca 'Safyr Hill' | 'Safyr Hill' American Holly | 8-10' B&B | | |
| Total: 2 | | | | | | |
| Ornamental Trees | | | | | | |
| AME ARB | 3 | Amelanchier arborea | Downy Serviceberry | 4-5' B&B | 10'-0" O.C. | Multistem |
| ASI TRI | 2 | Asimina triloba | Common Pawpaw | 4-5' B&B | | |
| CAR CAR | 1 | Carpinus caroliniana | American Hornbeam, Ironwood | 2-2 1/2' B&B | | |
| CLA KEN | 1 | Cladrastis lutea | American Yellowwood | 2-2 1/2' B&B | | |
| COR KOU | 1 | Cornus kousa | Kousa Dogwood, Japanese Dogwood | 2-2 1/2' B&B | | |
| COR MAS | 1 | Cornus mas | Cornelian Cherry | 2-2 1/2' B&B | | |
| HAL CAR | 1 | Halesia carolina | Carolina Silverbell | 2-2 1/2' B&B | | |
| HAM ARN | 4 | Hamamelis x intermedia 'Arnold's Promise' | Arnold's Promise Witch Hazel | 4-5' B&B | 8'-0" O.C. | |
| MAG VIR | 1 | Magnolia virginiana | Sweetbay Magnolia | 4-5' B&B | | |
| RHU TYP | 6 | Rhus typhina | Staghorn Sumac | 4-5' B&B | 8'-0" O.C. | |
| Total: 21 | | | | | | |
| Evergreen Shrubs | | | | | | |
| BUX IND | 51 | Buxus 'S818' | NewGen Independence Boxwood | #3 12-15" | 2'-6" O.C. | |
| VIB GRE | 8 | Viburnum rhytidophyllum 'Green Trump' | Green Trump Leatherleaf Viburnum | #3 10-36-48" | 4'-0" O.C. | |
| Total: 59 | | | | | | |
| Deciduous Shrubs | | | | | | |
| AES PAR | 4 | Aesculus parviflora | Butterbrush Buckeye | #10 24-30" | 6'-0" O.C. | |
| AOR GRO | 21 | Aronia melanocarpa 'CONCNAM012' | Ground Hug Black Chokeberry | #3 12-15" | 2'-6" O.C. | |
| CAL MIC | 5 | Calycanthus floridus 'Michael Lindsay' | Michael Lindsay Sweetshrub | #5 18-24" | 4'-6" O.C. | |
| CAR DAR | 6 | Carvopletis x claudonensis 'Dark Knight' | Dark Knight Blue Mist Shrub | #3 12-15" | 2'-6" O.C. | |
| CLE COM | 32 | Clethra alnifolia 'Compacta' | Compact Summersweet | #3 12-15" | 2'-6" O.C. | |
| COT ROY | 1 | Cotinus coggygia 'Royal Purple' | Royal Purple Smoke Tree | 4-5' B&B | | |
| DIE BUT | 4 | Diervilla sessilifolia 'Butterfly' | Butterfly Bush Honeysuckle | #3 18-24" | 4'-0" O.C. | |
| FOR LYN | 3 | Forsythia x intermedia 'Lynwood Gold' | Lynwood Gold Forsythia | 4-5' B&B | 6'-0" O.C. | |
| FOT MOU | 10 | Fothergilla major 'Mount Airy' | Mount Airy Fothergilla | #5 24-30" | 3'-6" O.C. | |
| HYD PGE | 6 | Hydrangea paniculata 'Grandiflora' | Pee Gee Hydrangea | 4-5' B&B | 7'-0" O.C. | |
| HYD QUE | 8 | Hydrangea coriifolia | Ookleaf Hydrangea | #5 24-30" | 5'-6" O.C. | |
| HYP HID | 12 | Hypericum x 'Hidcote' | Hidcote St. John's Wort | #5 18-24" | 2'-6" O.C. | |
| ITE LIT | 23 | Itea virginica 'Little Henry' | Little Henry Virginia Sweetspire | #3 12-15" | 2'-6" O.C. | |
| LIN BEN | 4 | Lindera benzoin | Spicebush | #5 24-30" | 6'-0" O.C. | |
| PRU MAR | 3 | Prunus maritima | Beach Plum | #5 18-24" | 4'-0" O.C. | |
| RHU ARO | 3 | Rhus aromatica | Fragrant Sumac | #2 24-30" | 5'-0" O.C. | |
| RHU LOW | 21 | Rhus aromatica 'Gro-Low' | Gro-Low Fragrant Sumac | #2 | 3'-6" O.C. | |
| SPI VAN | 5 | Spiraea x vanhouttei | Bridal Wreath Spirea | 4-5' B&B | 4'-0" O.C. | |
| SYR KAT | 3 | Syringa vulgaris 'Katherine Havemeyer' | Katherine Havemeyer Lilac | 4-5' B&B | 5'-6" O.C. | |
| SYR MOU | 1 | Syringa x hyoanciflora 'Mount Baker' | Mount Baker Lilac | 4-5' B&B | | |
| VAC BLU | 5 | Vaccinium corymbosum | Highbush Blueberry | #5 24-30" | 4'-0" O.C. | |
| VIB ACE | 5 | Viburnum acerifolium | Moppleleaf Viburnum | #5 24-30" | 5'-6" O.C. | |
| VIB CAR | 3 | Viburnum carlesii | Korean Spice Viburnum | #10 30-36" | 6'-0" O.C. | |
| VIB DEN | 3 | Viburnum dentatum | Arrowwood | #7 30-36" | 6'-0" O.C. | |
| Total: 193 | | | | | | |
| Herbaceous/Perennials/Grasses | | | | | | |
| GER ING | 36 | Geranium macrorrhizum 'Ingwersen's Variety' | Bigroot Cranesbill 'Ingwersen's Variety' | #1 | 1'-4" O.C. | |
| HEU AUT | 50 | Heuchera villosa 'Autumn Bride' | Autumn Bride Coral Bells | #1 | 1'-4" O.C. | |
| HOS PLA | 13 | Hosta plantainea | Fragrant Hosta | #2 | 2'-0" O.C. | |
| PAC TER | 66 | Pachysandra terminalis | Pachysandra terminalis | LP50 | 1'-0" O.C. | |
| PHL DAV | 17 | Phlox paniculata 'David' | David Garden Phlox | #1 | 1'-6" O.C. | |
| POL ACR | 20 | Polystichum acrostichoides | Christmas Fern | #1 | 1'-6" O.C. | |
| RUD GOV | 9 | Rudbeckia fulgida var. 'sulfurina' 'Goldsturm' | Orange Coneflower | #1 | 1'-6" O.C. | |
| SCH OVA | 45 | Schizachyrium scoparium 'Standing Ovation' | Little Bluestem 'Standing Ovation' | #1 | 2'-0" O.C. | |
| Total: 256 | | | | | | |
| Vines | | | | | | |
| PAR RED | 7 | Parthenocissus quinquefolia 'Trox' ppaf | Red Wall® Virginia Creeper | #1 | 8'-0" O.C. | |
| Total: 7 | | | | | | |



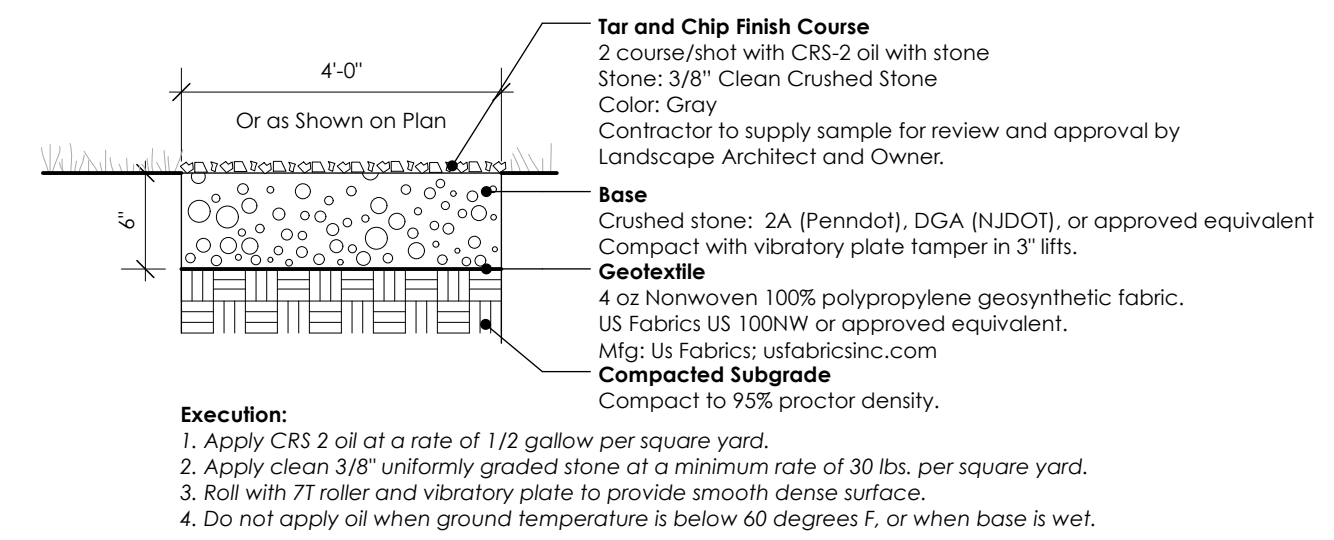
| PLANT SCHEDULE | | Latin Name | Common Name | Size | Spacing | Remarks |
|-------------------------|----------|-----------------------------|-----------------------------|--------------|-------------|---------|
| Symbol | Quantity | | | | | |
| Canopy Trees | | | | | | |
| LIQ STY | 3 | Liquidambar styraciflua | American Sweetgum | 2-2 1/2' B&B | 24'-0" O.C. | |
| NYS SYL | 1 | Nyssa sylvatica | Black Gum, Tupelo | 2-2 1/2' B&B | | |
| PLA OCC | 1 | Platanus occidentalis | Sycamore | 2-2 1/2' B&B | | |
| ULM FRI | 1 | Ulmus americana 'Pincetone' | Princeton Elm | 2-2 1/2' B&B | | |
| Total: 6 | | | | | | |
| Evergreen Trees | | | | | | |
| ILE SAT | 2 | Ilex opaca 'Safyr Hill' | 'Safyr Hill' American Holly | 8-10' B&B | | |
| Total: 2 | | | | | | |
| Ornamental Trees | | | | | | |
| AME ARB</ | | | | | | |



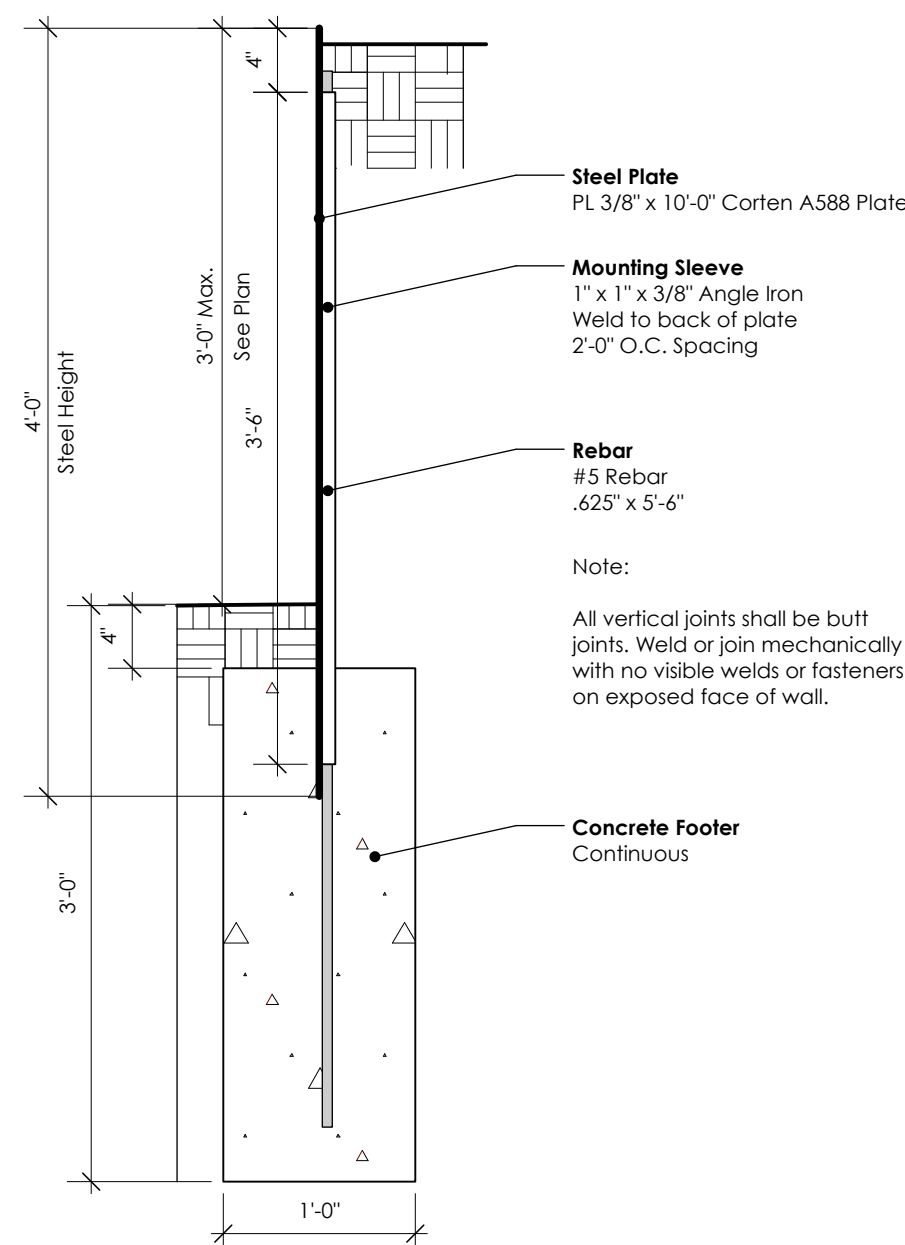
1 Corten Steel Wall with Facsimile Stone Road Plan
 Scale: 1/8" = 1'-0"



2 Corten Steel Wall (18" Max. Height) (A)
 Scale: 1" = 1'-0"



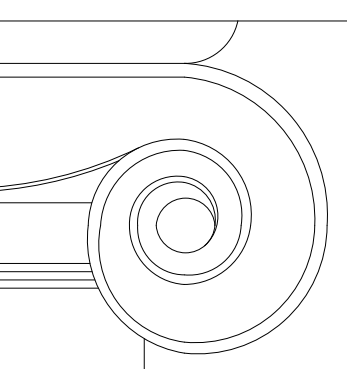
3 Tar and Chip Path
 Scale: 1" = 1'-0"



4 Corten Steel Wall (36" Max. Height) (B)
 Scale: 1" = 1'-0"

Notes:

- All work requiring excavation in area of stone road shall be reviewed, approved, and supervised by project archaeologist.



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 NJ 21A1018244500

PROJECT No. : 1836C

DATE : 30 JUNE 2021

REVISIONS :

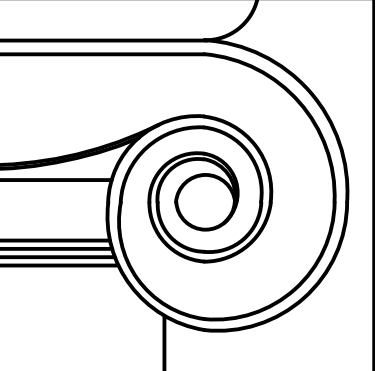
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RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
 TOWNSHIP OF PISCATAWAY
 MIDDLESEX COUNTY, NEW JERSEY

JOHN MORGAN THOMAS
LANDSCAPE ARCHITECTS, P.C.
 4 South Union Street Suite 300
 Lambertville, New Jersey 08530
 609.397.9070

John Morgan Thomas
 NJ LLA # AS00698

L3



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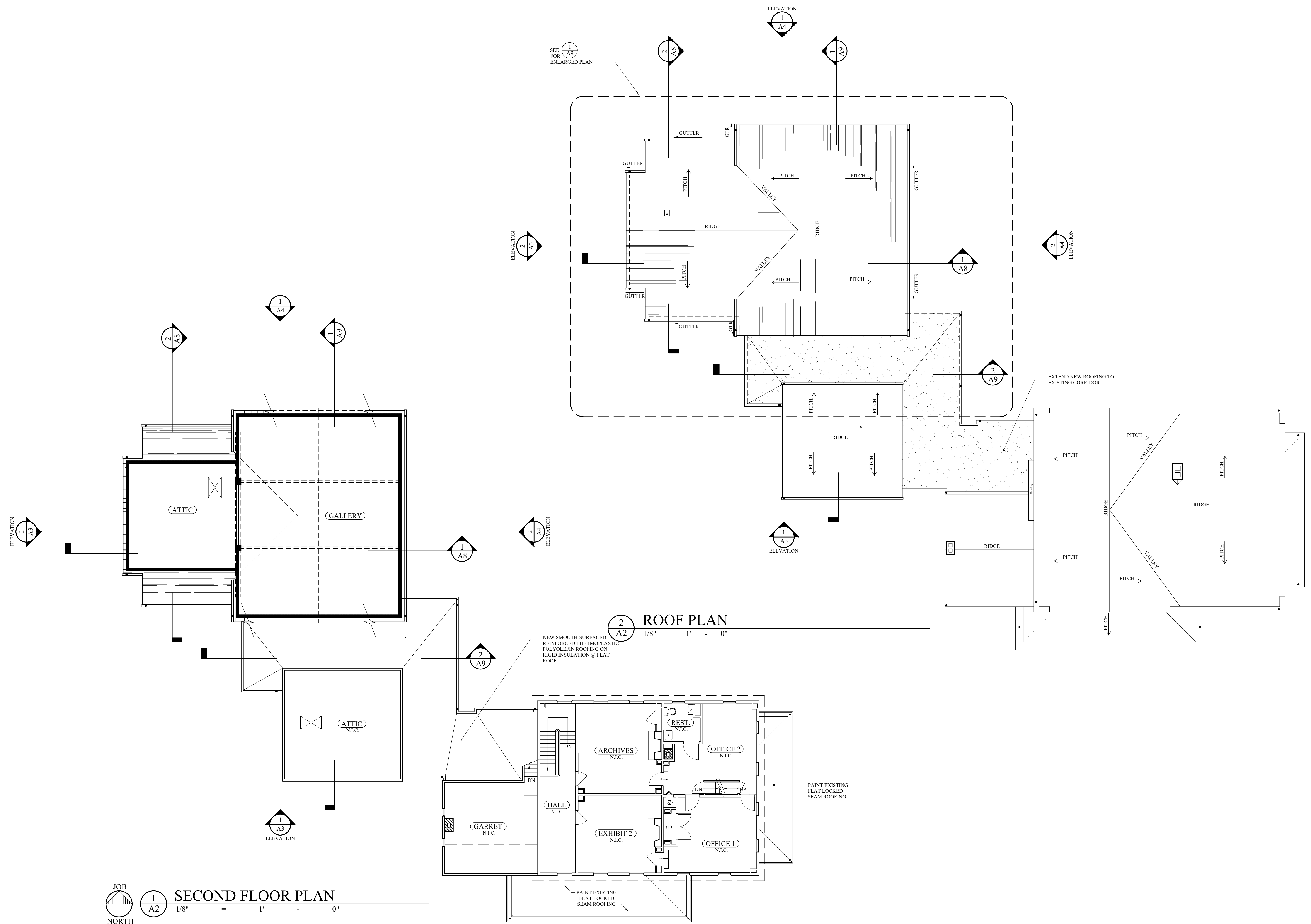
THOMAS B. CONNOLLY, AIA
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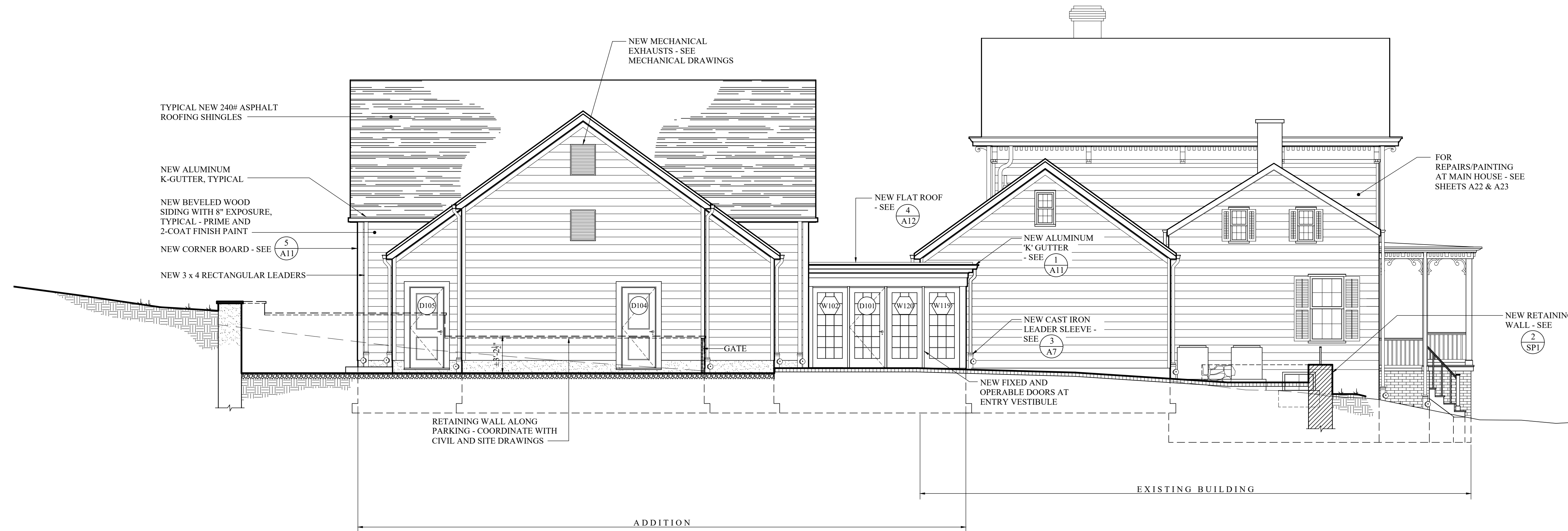
PROJECT No.: 1836C
 DATE: 30 JUNE 2021
 REVISIONS:

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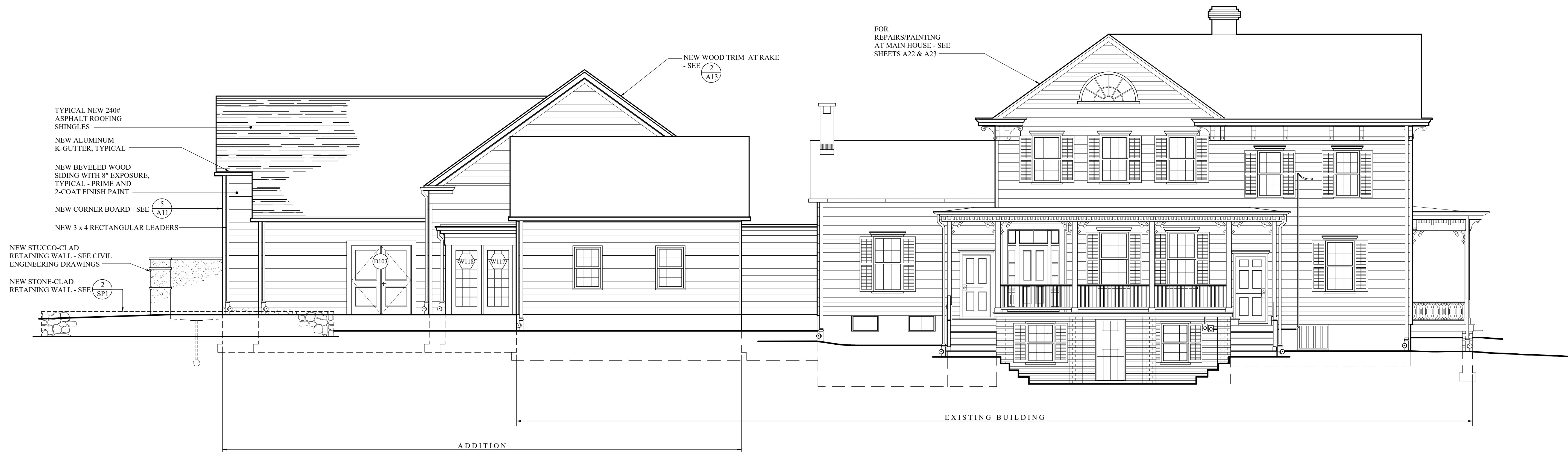
RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
 TOWNSHIP OF PISCATAWAY
 MIDDLESEX COUNTY, NEW JERSEY

A2

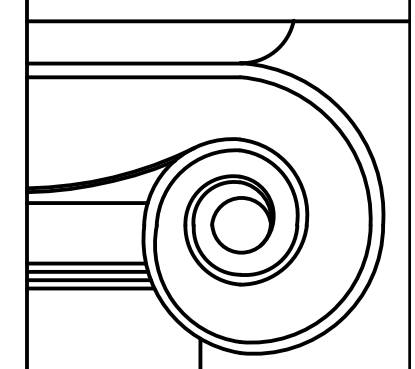




2 WEST ELEVATION
 A3 3/16" = 1' - 0"



1 SOUTH ELEVATION
 A3 3/16" = 1' - 0"



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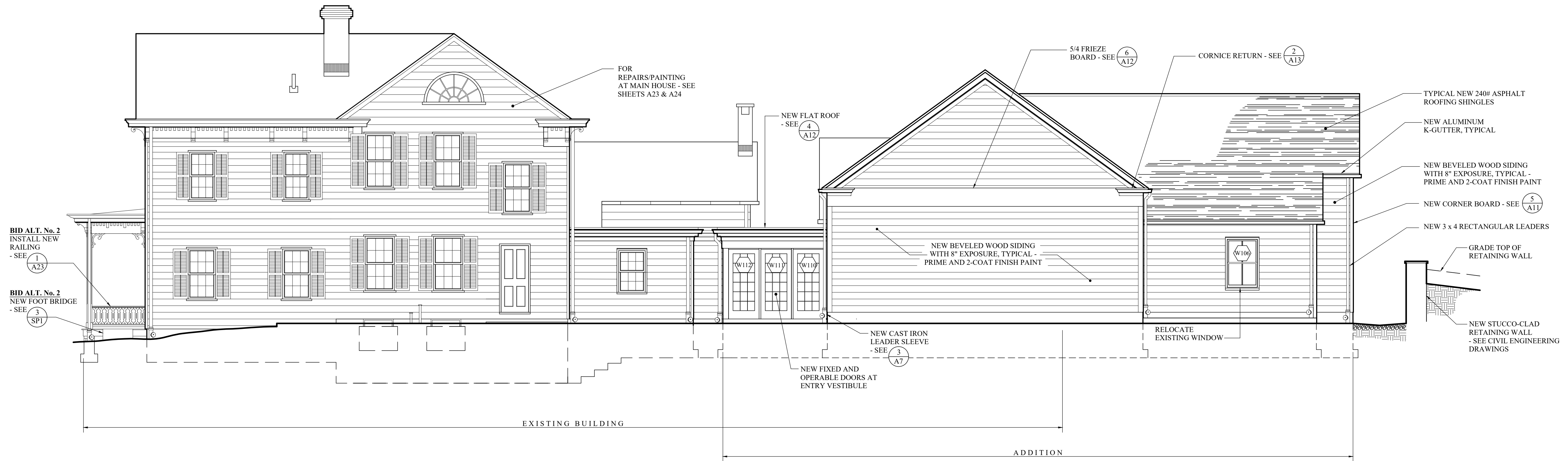
THOMAS B. CONNOLLY, AIA
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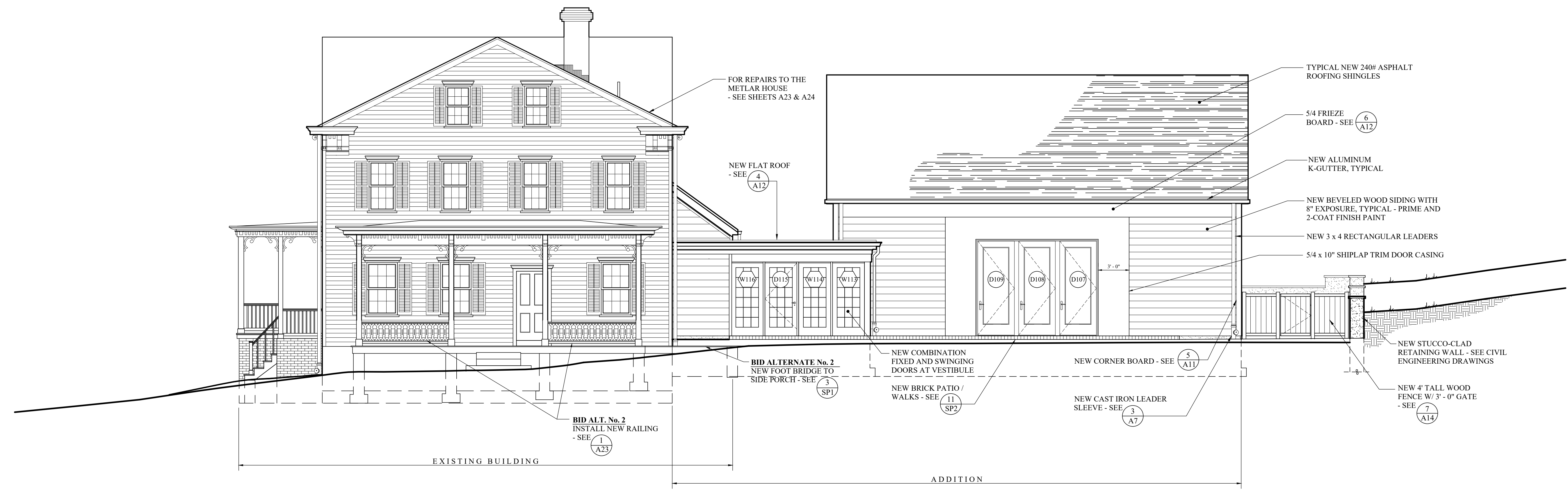
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RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
 TOWNSHIP OF PISCATAWAY
 MIDDLESEX COUNTY, NEW JERSEY

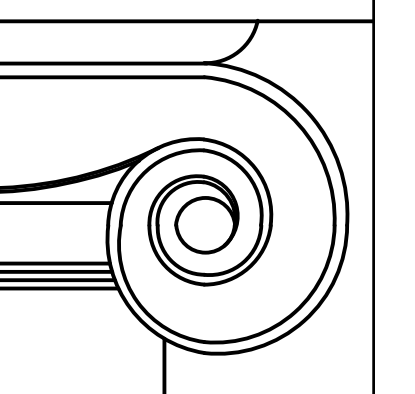
A3



1 NORTH ELEVATION
 A4 3/16" = 1' - 0"



2 EAST ELEVATION
 A4 3/16" = 1' - 0"



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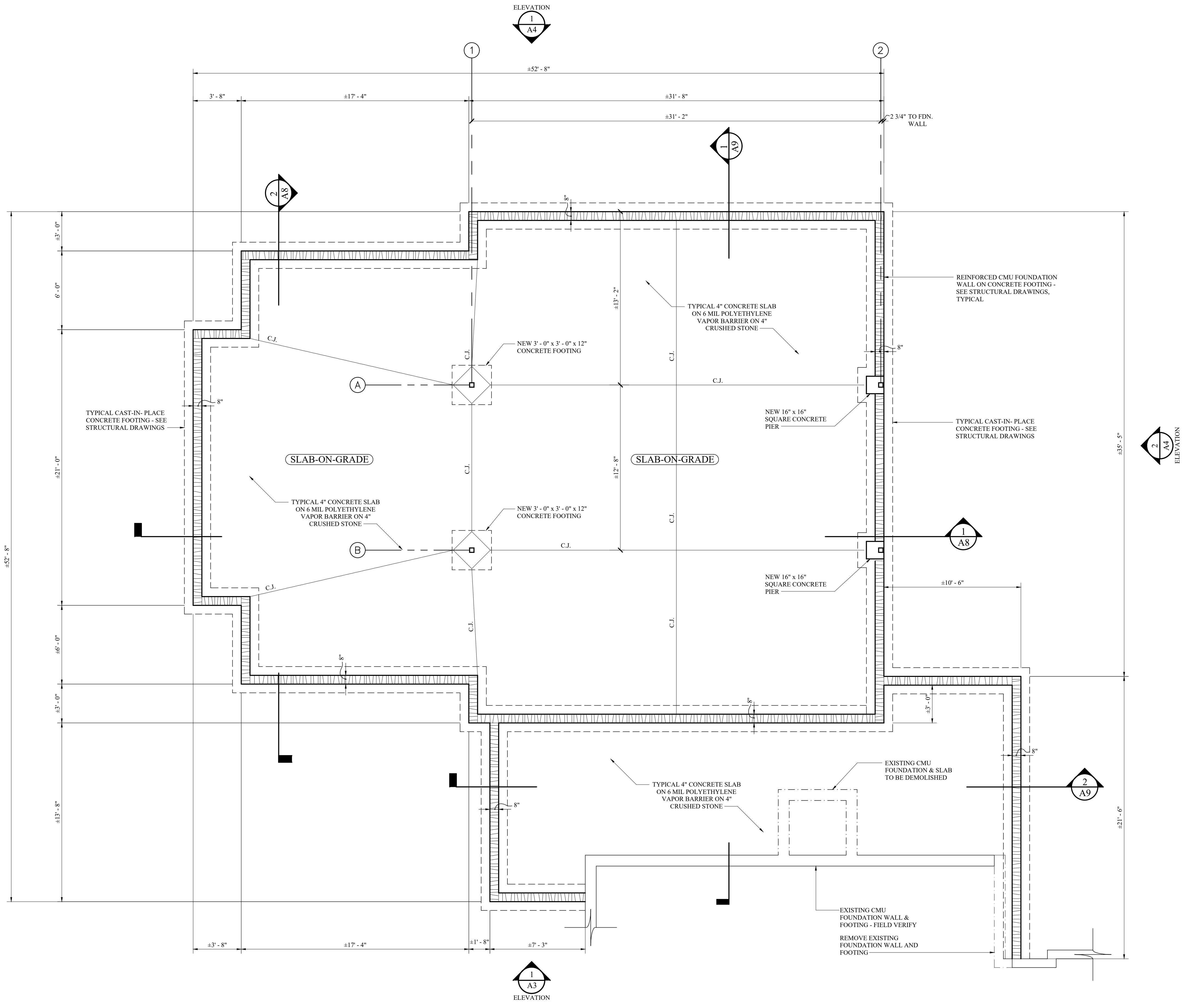
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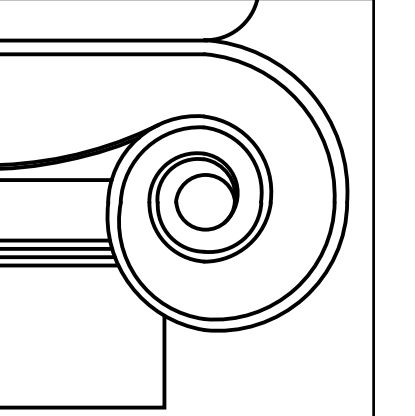
RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
 TOWNSHIP OF PISCATAWAY
 MIDDLESEX COUNTY, NEW JERSEY

A4



JOB NORTH  1/A5 1/4" = 1' 0"

ENLARGED FOUNDATION PLAN @ ADDITION



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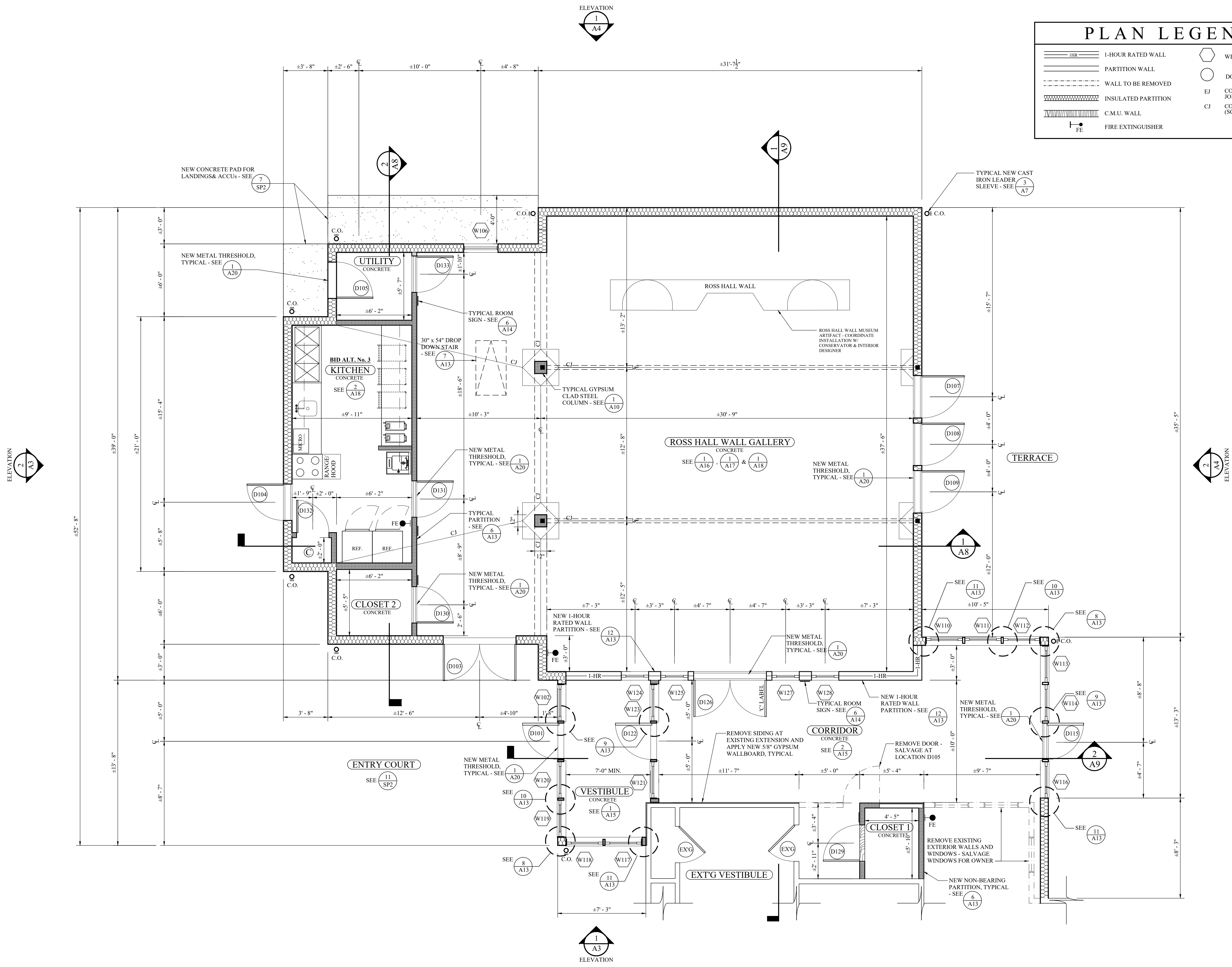
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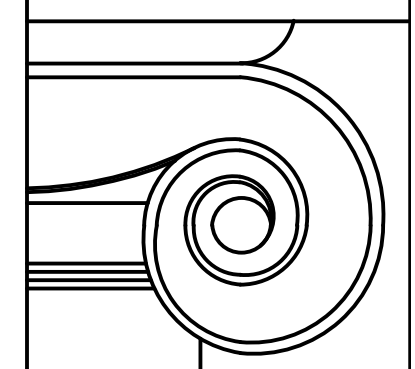
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RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
 TOWNSHIP OF PISCATAWAY
 MIDDLESEX COUNTY, NEW JERSEY

A5



| PLAN LEGEND | |
|-------------|------------------------------------|
| | 1-HOUR RATED WALL |
| | PARTITION WALL |
| | WALL TO BE REMOVED |
| | INSULATED PARTITION |
| | C.M.U. WALL |
| | FIRE EXTINGUISHER |
| | WINDOW SYMBOL |
| | DOOR SYMBOL |
| | EJ CONCRETE EXPANSION JOINT |
| | CJ CONCRETE CONTROL (SCORED) JOINT |



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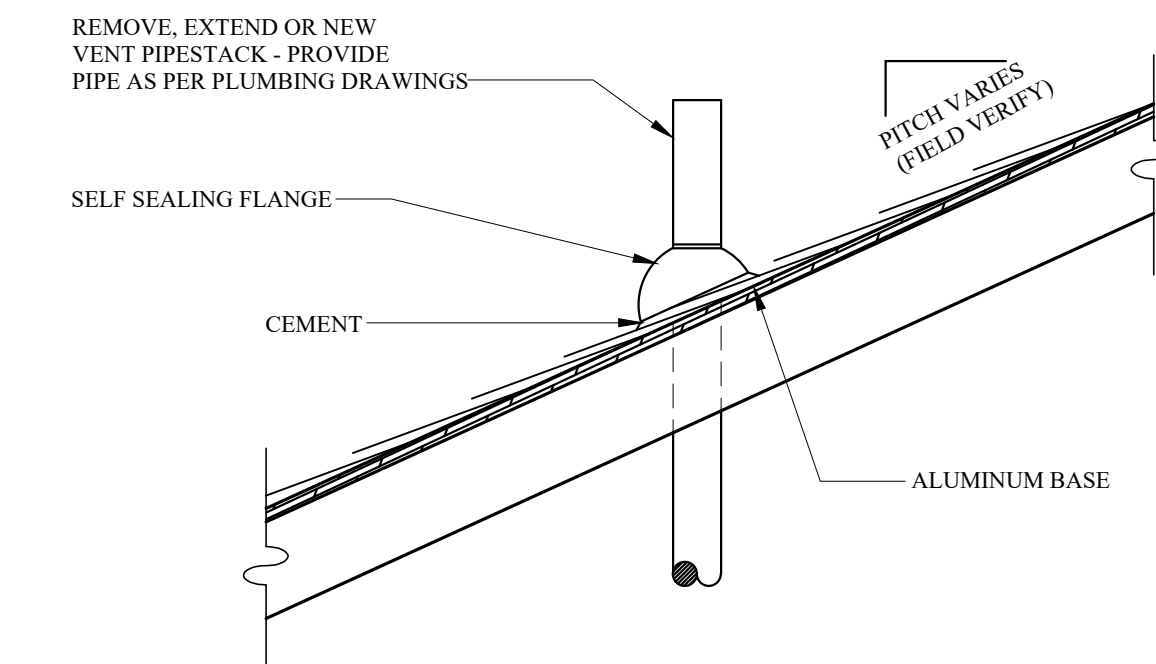
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HISTORIC METLAR-BODINE HOUSE
 TOWNSHIP OF PISCATAWAY
 MIDDLESEX COUNTY, NEW JERSEY

JOB NORTH
 1 A6 1/4" = 1' 0"
ENLARGED FIRST FLOOR PLAN @ ADDITION

A6

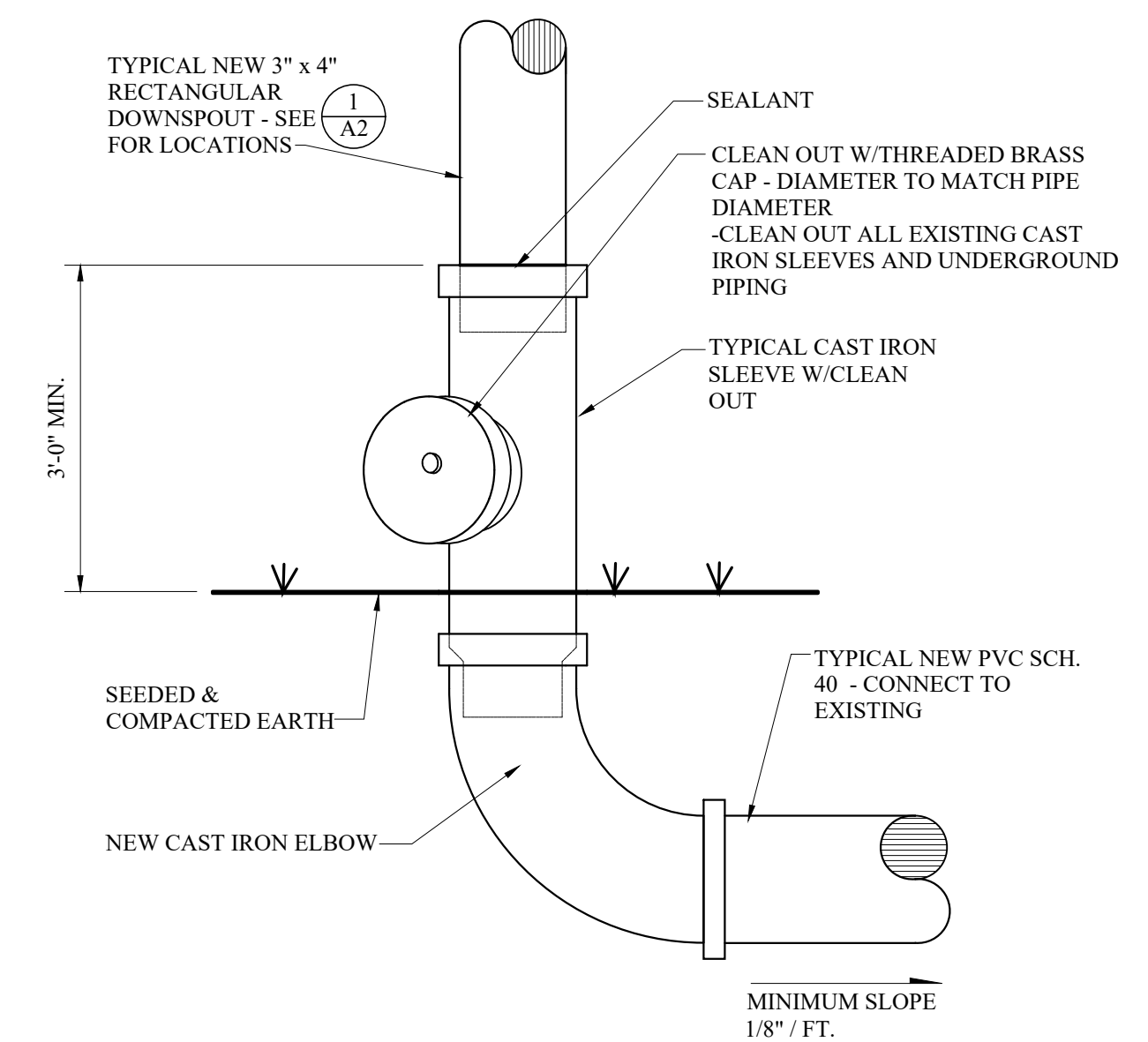
ROOFING NOTES

- CONTRACTOR IS SOLELY RESPONSIBLE FOR ALL SHORING AND BRACING RELATED TO ALL ROOFING AND DEMOLITION WORK.
- NOTIFY ARCHITECT TWO (2) DAYS PRIOR TO ANY DEMOLITION TO SCHEDULE INSPECTION OF EXISTING SHEATHING CONDITIONS PRIOR TO RE-ROOFING ACTIVITIES.
- REMOVE ALL EXISTING LAYERS OF FLASHING AND UNDERLAYMENT FROM ALL ROOFS AS SHOWN ON THE DRAWINGS.
- REMOVE ALL DETERIORATED ROOF SHEATHING AS DIRECTED BY ARCHITECT. ANY SHEATHING REMOVED PRIOR TO THE ARCHITECT'S AUTHORIZATION SHALL BE DONE SO AT THE CONTRACTOR'S EXPENSE.
- DO NOT REMOVE MORE ROOFING THAN CAN BE RE-ROOFED OR MADE PROPERLY WATERTIGHT IN ONE DAY. ALL TAPES AND TEMPORARY WATERPROOFING SHALL BE PROPERLY SECURED TO PROHIBIT THE ADMITTANCE OF WATER INTO THE STRUCTURE.
- ENSURE THAT THE ROOF DECK IS CLEAN, SMOOTH AND DRY BEFORE ROOFING.
- THE UNDERLAYMENT OF ALL ASPHALT SHINGLE ROOFS SHALL BE TWO LAYERS OF 15# REINFORCED ASPHALT IMPREGNATED ROOFING FELT OVER SMOOTH SURFACE, SELF-ADHERED, BUTYL MEMBRANE FLASHING AND AS SHOWN ON DRAWINGS. SEPARATE ALL FLASHING AND OTHER METALS FROM ASPHALTIC MATERIALS BY INSTALLING ROSIN PAPER. USE VERTICAL AND HORIZONTAL CHALK LINES ON ROOF TO GUIDE INSTALLATION AND ENSURE AN ACCURATE TILE LAYOUT.
- ROOFING FELT SHALL MEET OR EXCEED ASTM STANDARDS D226/D2262.
- PROVIDE STANDARD 5 INCH WIDE "K" GUTTERS OF WHITE ALUMINUM AND 4" RECTANGULAR LEADERS AS SHOWN ON THE DRAWINGS FOR PROPER STORM WATER HANDLING AND DRAINAGE. HUNG MOLDED GUTTERS SHALL MATCH THE EXISTING IN SIZE AND SHAPE AND BE MADE FROM 8" - 0" OR 10" - 0" LONG SHEETS OF 20ga. ALUMINUM.
- ADJACENT SECTIONS OF GUTTER SHALL BE JOINED BY 4" WIDE LAPPED, RIVETED AND SEALED SEAMS, USING 3/16" DIAMETER RIVETS, 2" ON CENTER, WITH ALUMINUM BURRS UNDER PEENED HEADS OF THE RIVETS.
- INSTALL TAPERED RIGID INSULATION AT FLAT ROOF HAVING A MINIMUM THICKNESS OF ONE (1) INCH WITH A SLOPE OF 1/4" PER FOOT DIRECTLY OVER WOOD SHEATHING. INSTALL 1/4" RECOVERY BOARD OVER INSULATION.
- INSTALL SELF-ADHERING BUTYL MEMBRANE FLASHING AS INDICATED ON THE DRAWINGS.
- INSTALL 240# ASPHALT ROOFING SHINGLES - COLOR AND PATTERN TO MATCH SHINGLES AT EXISTING EXISTING ROOF. CERTAINTED LANDMARK PRO DESIGNER SHINGLES WITH A 30 YEAR WARRANTY.
- INSTALL FLUID-APPLIED ROOFING AND FLASHING MEMBRANE SYSTEM AS SHOWN ON THE DRAWINGS.
- WHERE INDICATED ON THE DRAWINGS, INSTALL ALUMINUM FLASHING IN THE GAUGE SHOWN (ON THE DRAWINGS). USE CLAYS WHERE REQUIRED. USE ONLY STAINLESS NAILS.
- ENSURE THAT THE ROOF DECK IS CLEAN, SMOOTH AND DRY BEFORE ROOF TILES ARE INSTALLED.
- ALL NEW CANT STRIPS, WOOD NAILERS AND FIELD TILE NAILER STRIPS SHALL BE OF PRESERVATIVE TREATED LUMBER.
- SMOOTH-SURFACE, HIGH-TEMPERATURE, SELF-ADHERING BUTYL MEMBRANE FLASHING SHALL BE INSTALLED DIRECTLY TO SOLID SHEATHING AS SHOWN ON DRAWINGS.
- INSTALL ALUMINUM FLASHING UNLESS OTHERWISE INDICATED. USE ONLY STAINLESS STEEL NAILS.



FLASHING @ TYPICAL PIPE PENETRATION

2
A7
N. T. S.



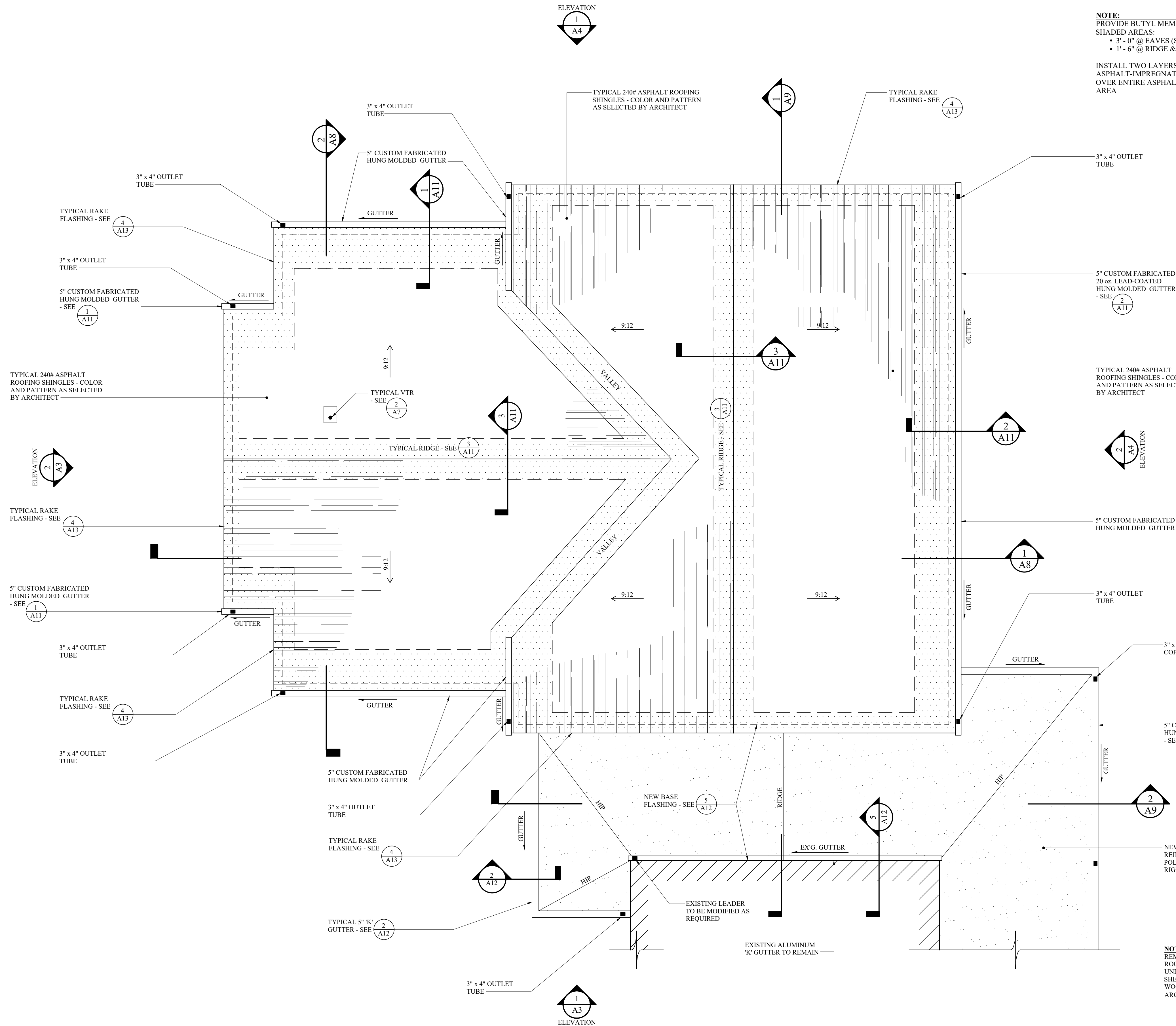
3 A7 CAST-IRON LEADER SLEEVE

1 1/2" = 1' - 0"

NOTE:
PROVIDE BUTYL MEMBRANE FLASHING @ SHADED AREAS:
• 3" - 0" @ EAVES (SEE ROOFING NOTES)
• 1" - 6" @ RIDGE & GABLE ENDS

INSTALL TWO LAYERS OF 15# REINFORCED ASPHALT-IMPREGNATED ROOFING FELT OVER ENTIRE ASPHALT ROOF SHINGLE AREA

NOTE:
REMOVE ALL LAYERS OF EXISTING FLAT ROOFING, GUTTERS, FLASHING AND UNDERLAYMENT - CALL ARCHITECT FOR SHEATHING INSPECTION - INSTALL NEW WOOD SHEATHING AS DIRECTED BY ARCHITECT



JOB
1
A7
ENLARGED ROOF PLAN @ ADDITION
1/4" = 1' - 0"

CONNOLLY & HICKEY

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NJ 21A101824500

PROJECT No.: 1836C

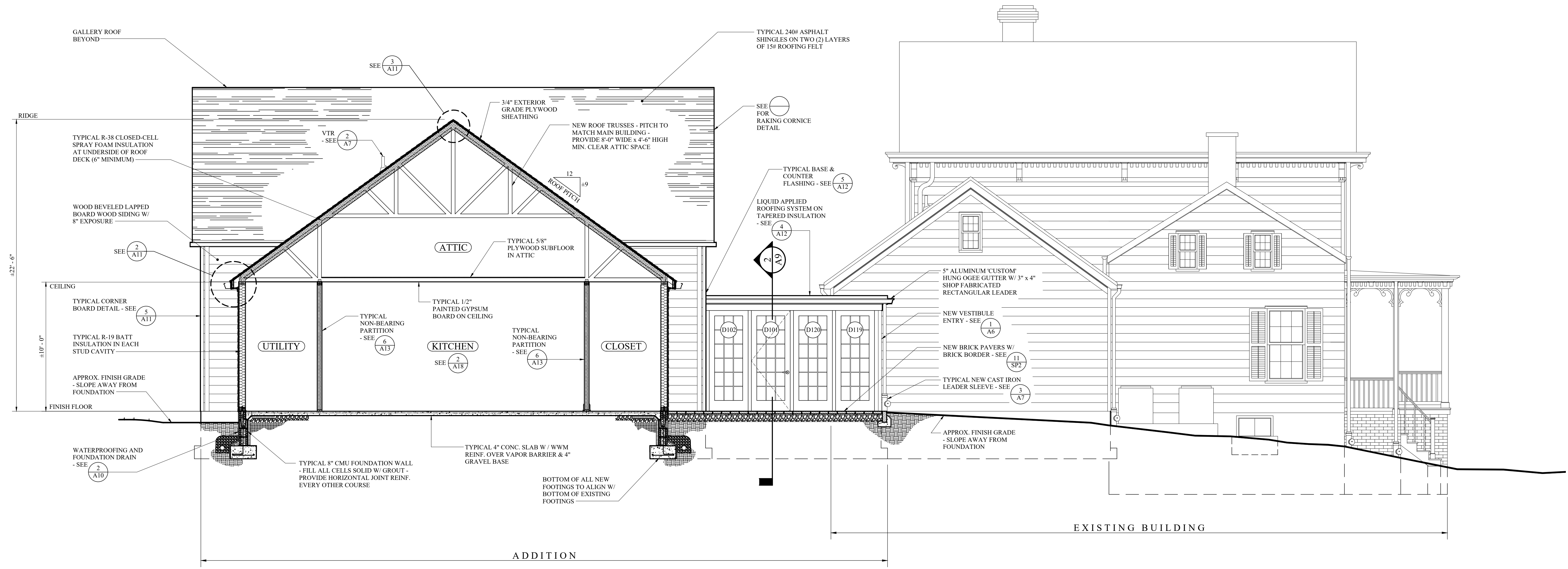
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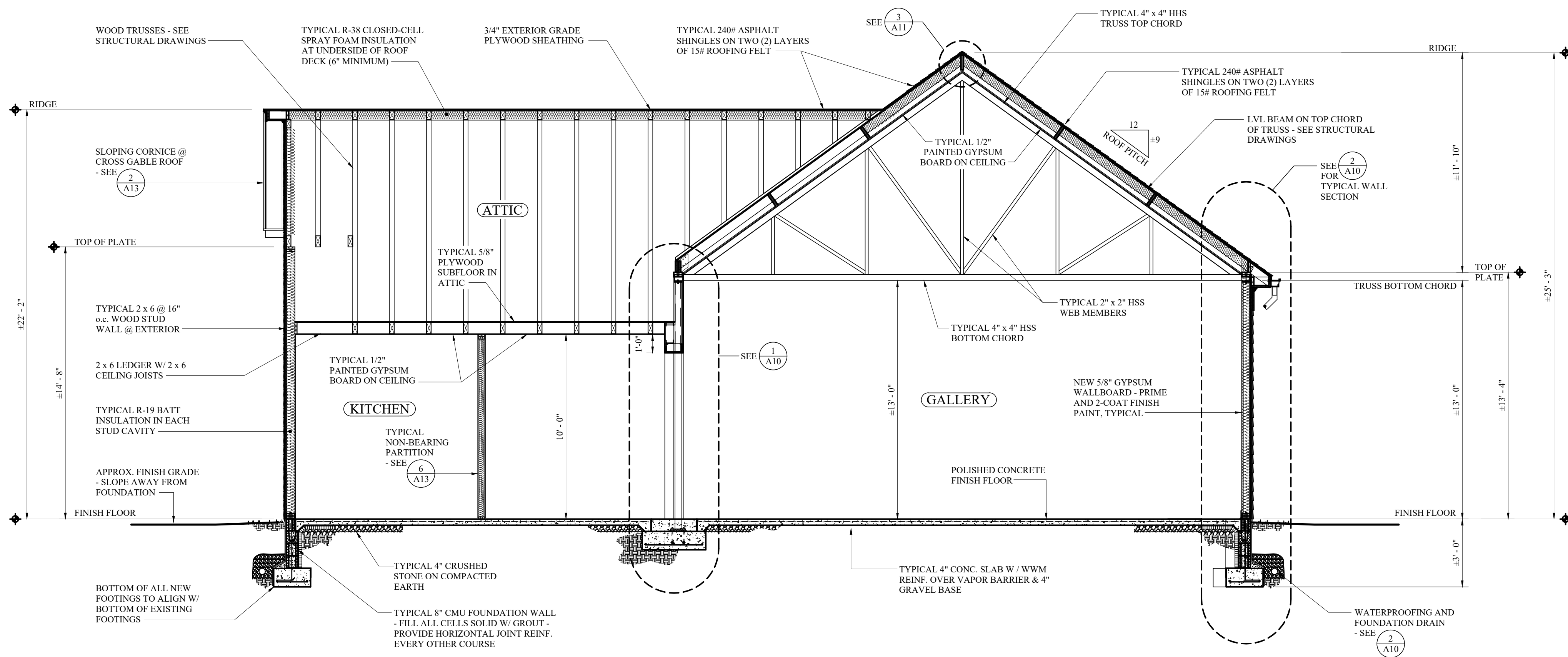
RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
TOWNSHIP OF PISCATAWAY
MIDDLESEX COUNTY, NEW JERSEY

A7



2
A8 1/4" = 1' 0"

BUILDING SECTION THRU KITCHEN



1
A8 1/4" = 1' 0"

BUILDING SECTION THRU KITCHEN / GALLERY

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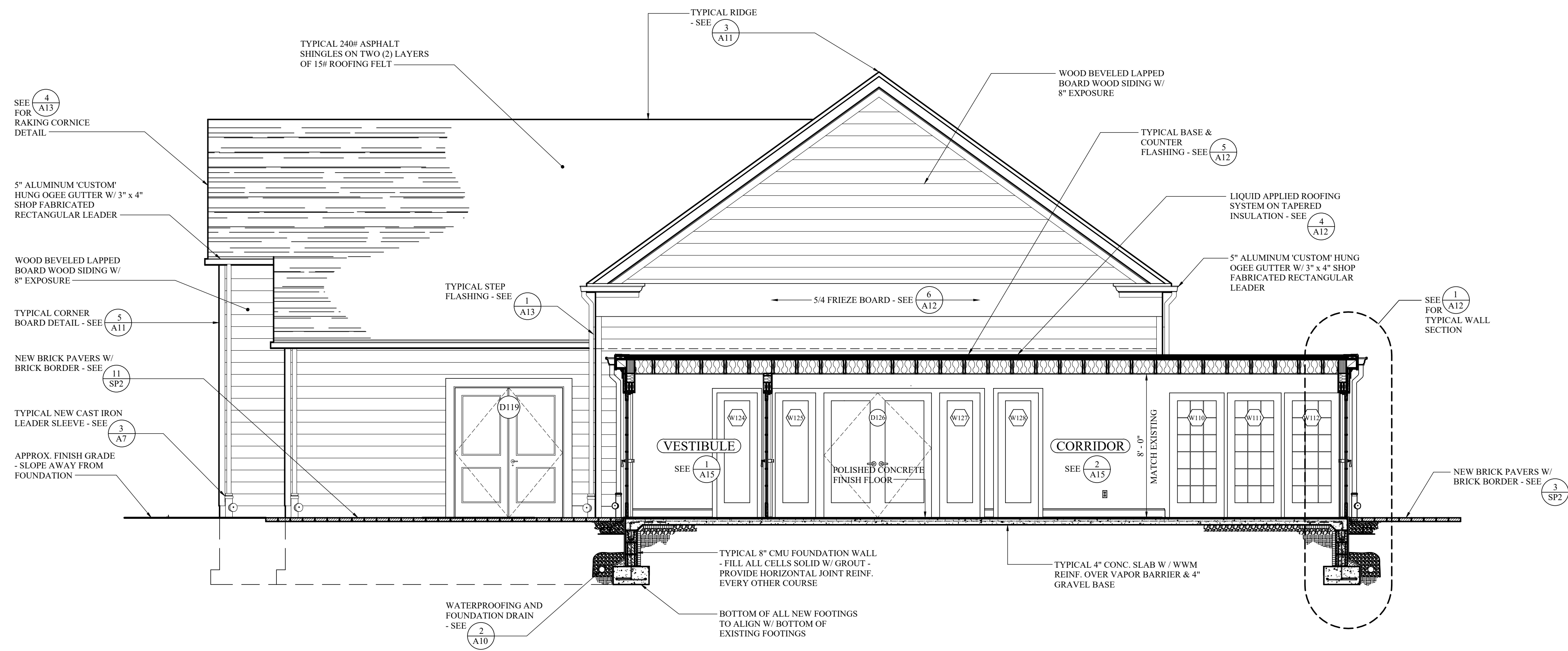
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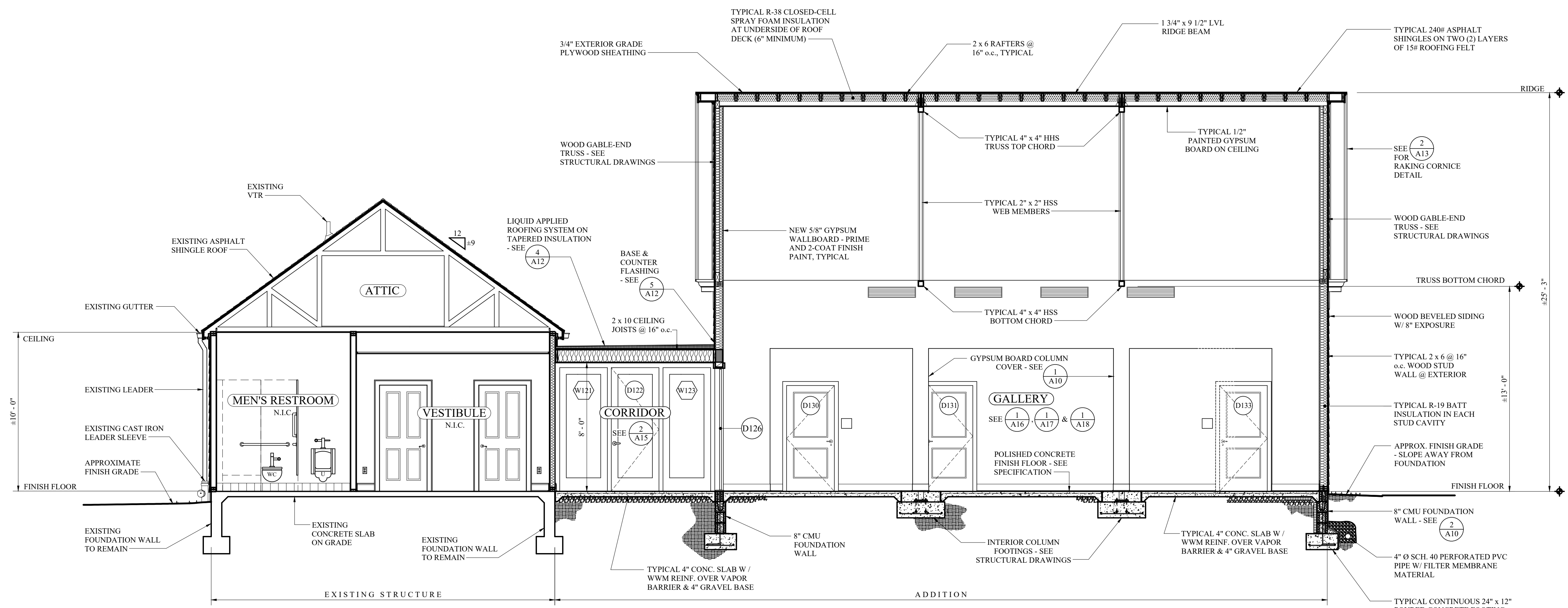
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RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
 TOWNSHIP OF PISCATAWAY
 MIDDLESEX COUNTY, NEW JERSEY

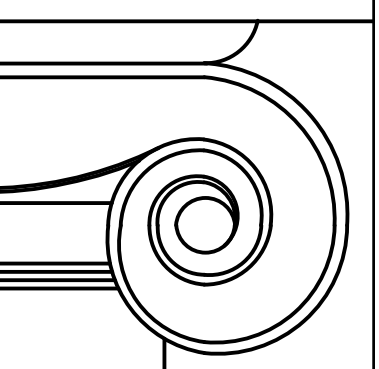
A8



2
A9 BUILDING SECTION THRU CORRIDOR
1/4" = 1' 0"



1
A9 BUILDING SECTION THRU CORRIDOR / GALLERY
1/4" = 1' 0"



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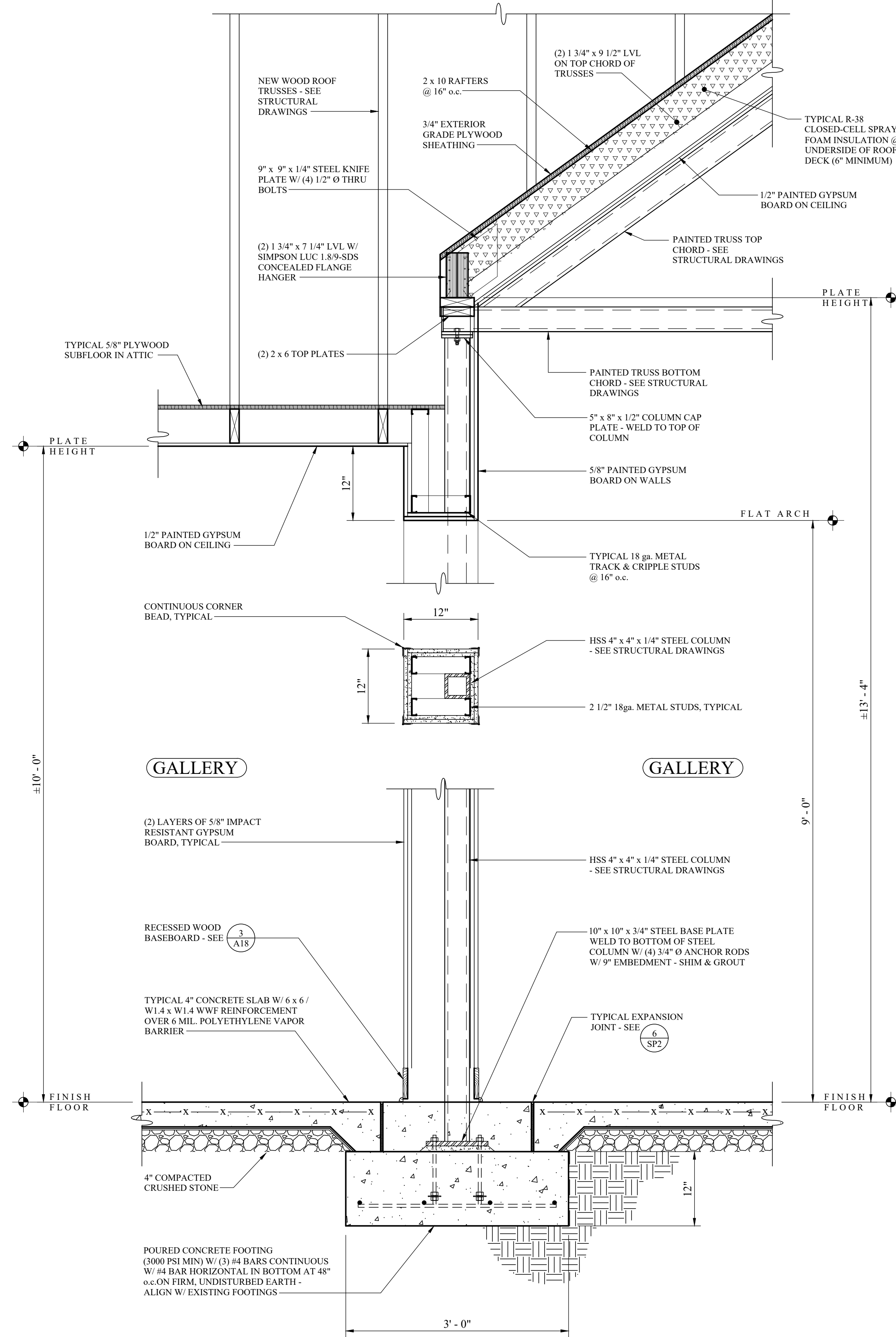
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RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
TOWNSHIP OF PISCATAWAY
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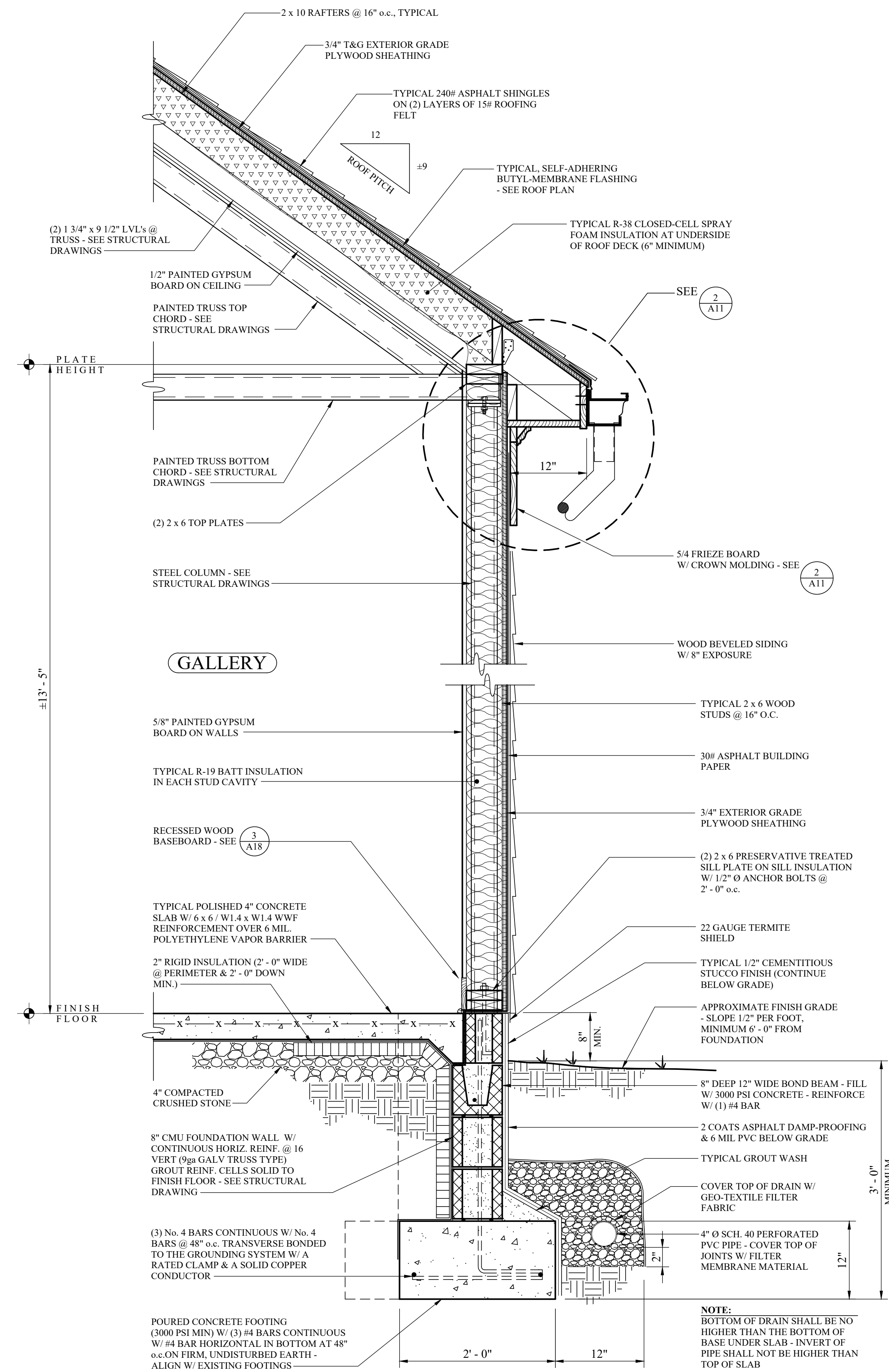
A9



1
A10

TYPICAL WALL SECTION @ GALLERY COLUMNS

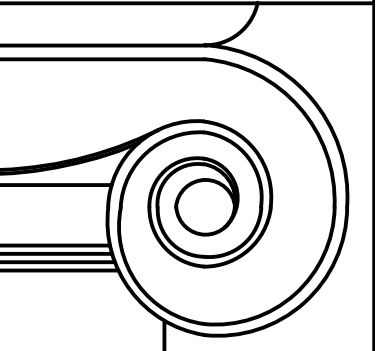
1" = 1' = 0"



2
A10

TYPICAL WALL SECTION

1" = 1' = 0"



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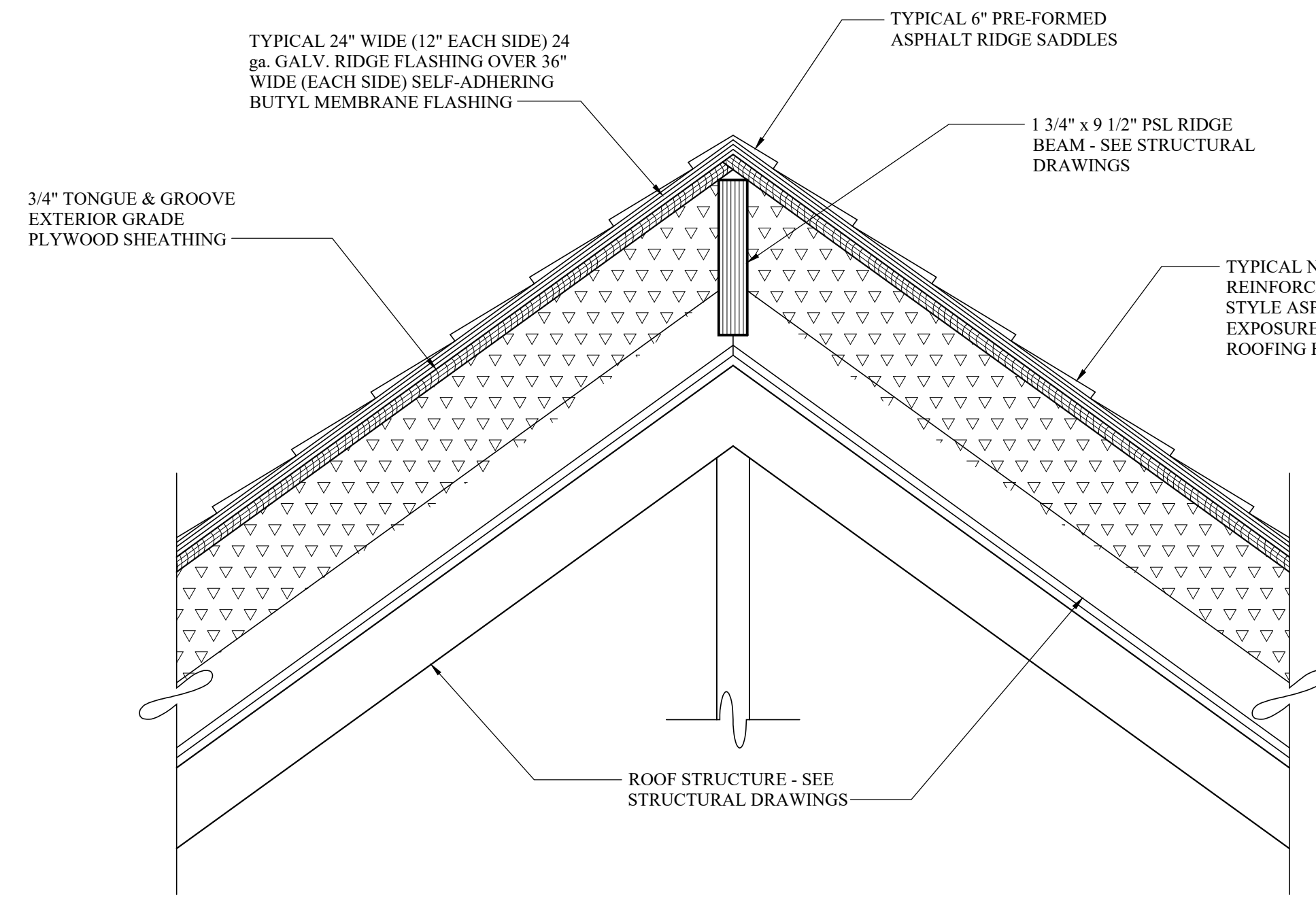
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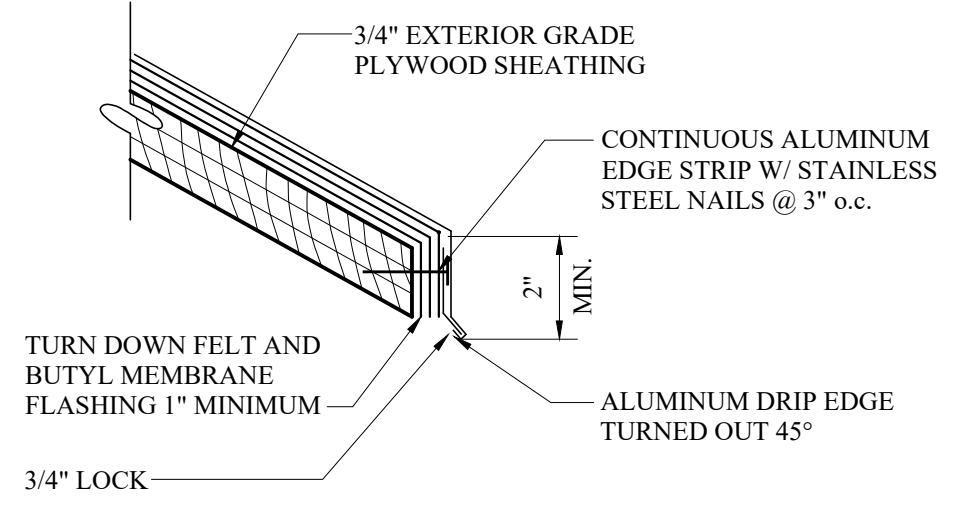
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HISTORIC METLAR-BODINE HOUSE
TOWNSHIP OF PISCATAWAY
MIDDLESEX COUNTY, NEW JERSEY

A10

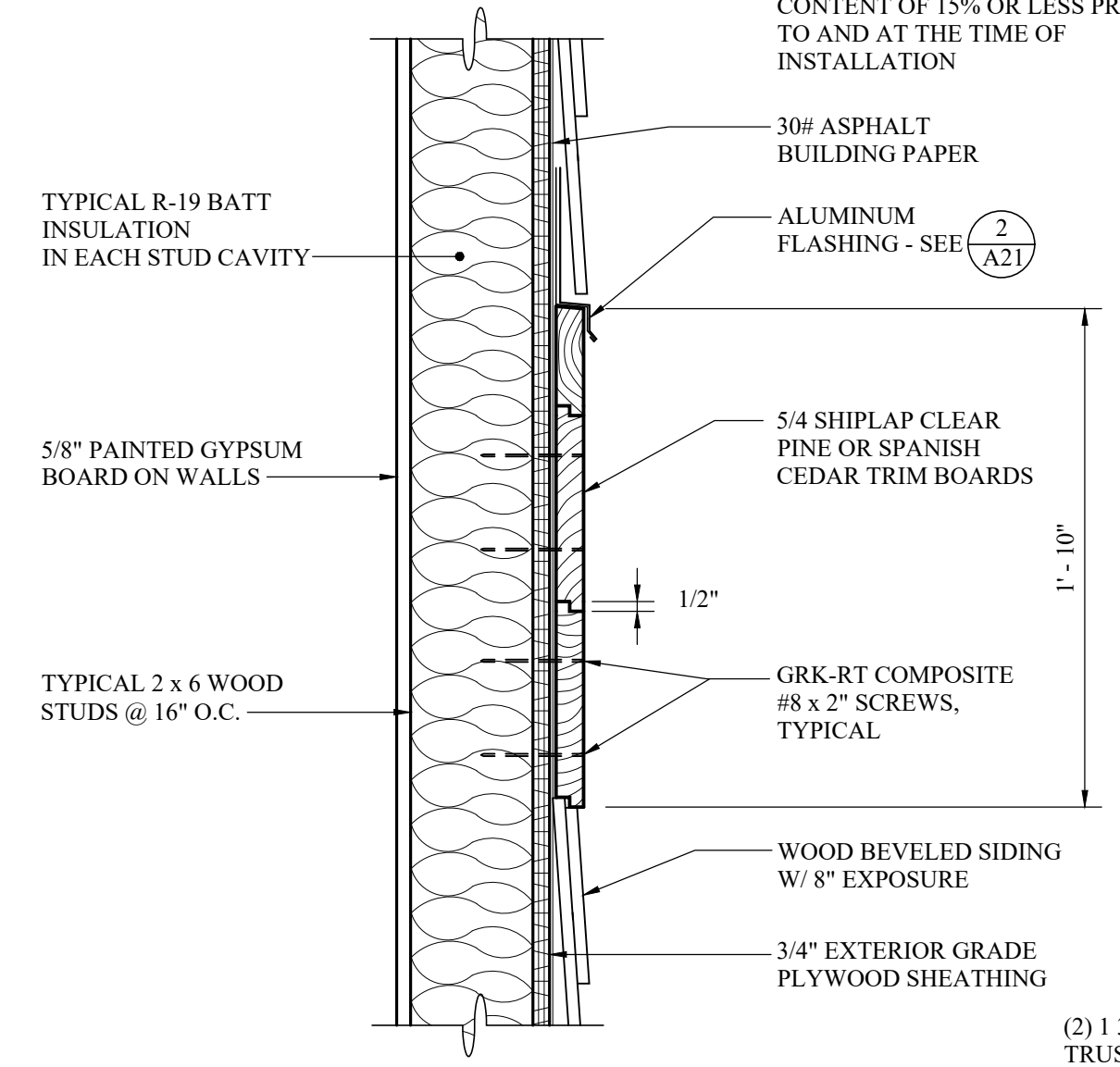


3
A11 TYPICAL RIDGE DETAIL

4
A11 DRIP EDGE DETAIL

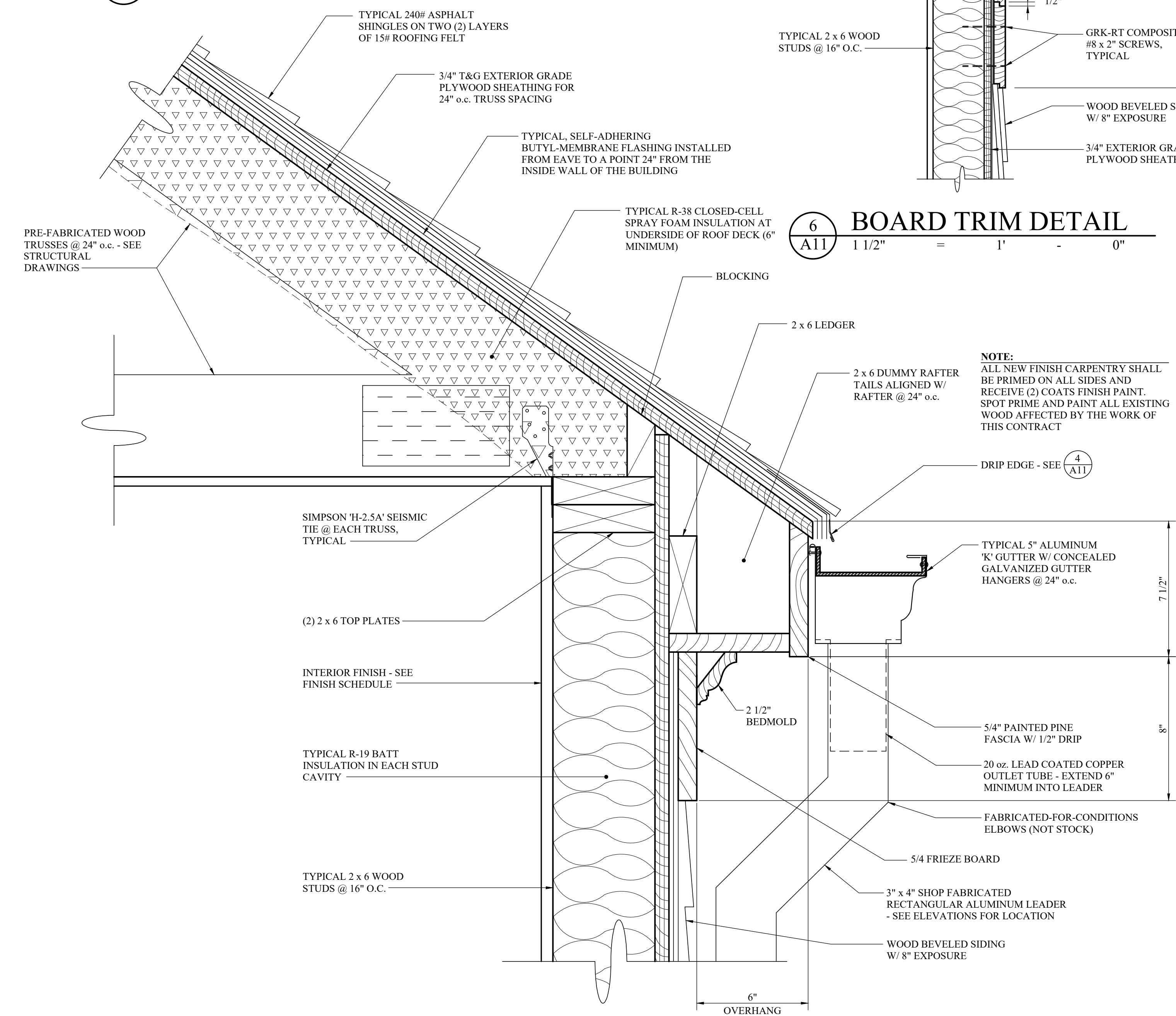
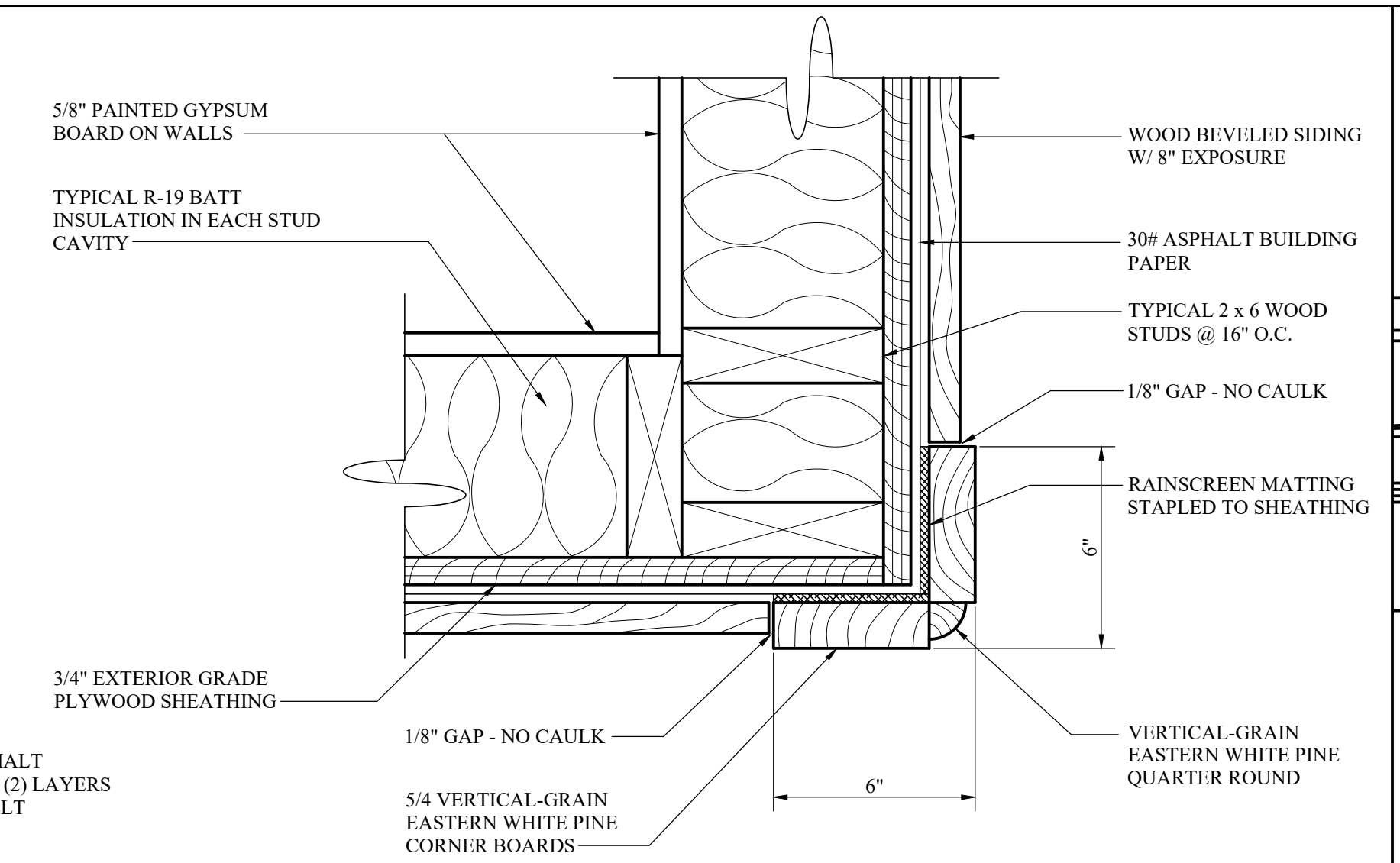


NOTE:
WOOD SHALL HAVE A MOISTURE CONTENT OF 15% OR LESS PRIOR TO AND AT THE TIME OF INSTALLATION

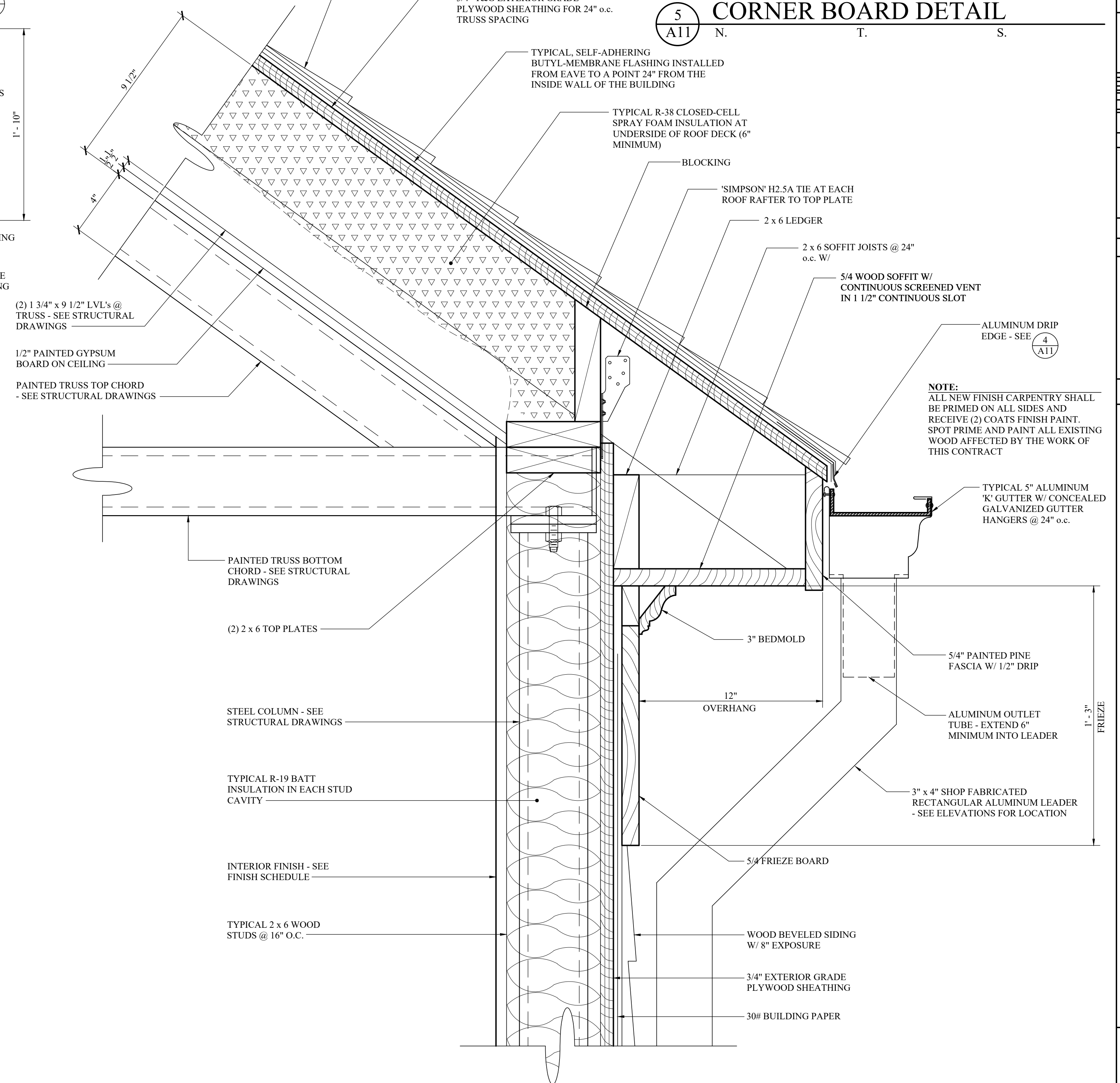


6
A11 BOARD TRIM DETAIL

5
A11 CORNER BOARD DETAIL



1
A11 TYPICAL EAVE DETAIL @ LOWER GABLE



2
A11 TYPICAL EAVE DETAIL @ GALLERY

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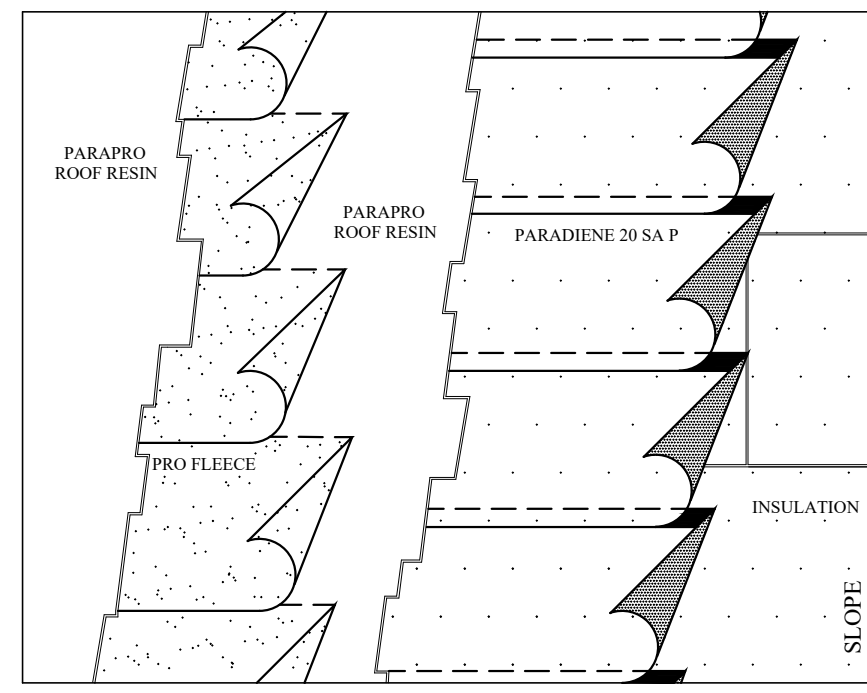
PROJECT No.: 1836C
DATE: 30 JUNE 2021

REVISIONS:

DRAWN BY: TBC, MMH, MS

RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
TOWNSHIP OF PISCATAWAY
MIDDLESEX COUNTY, NEW JERSEY

A11

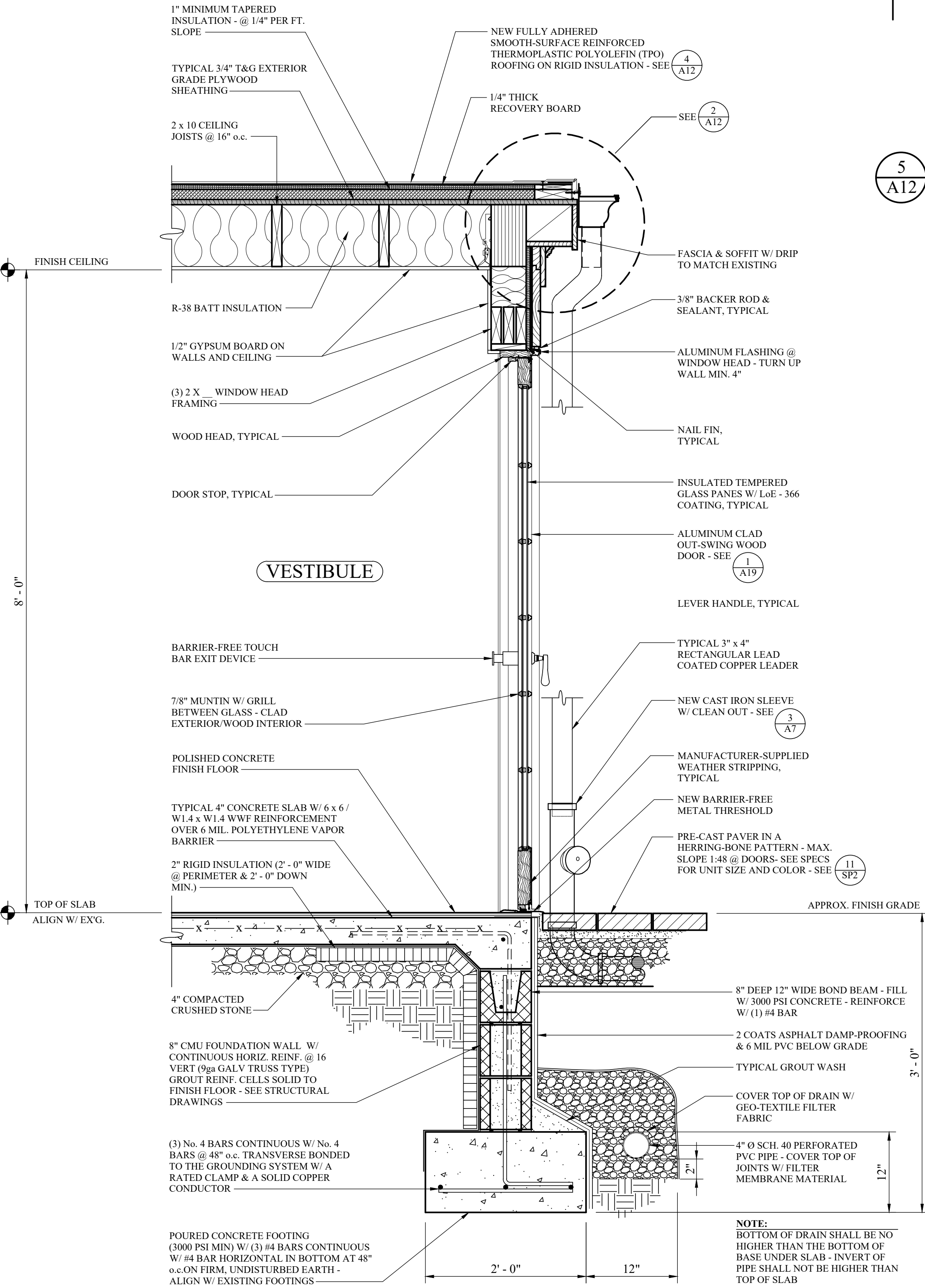


| | |
|--------------------|---------------------------------|
| SLOPE MATERIAL | 0" per foot min.* per 100 sq ft |
| INSULATION | |
| PARADIENE 20 SA | 69 lb |
| PARAPRO ROOF RESIN | 19 kg |
| PRO FLEECE | |
| PARAPRO ROOF RESIN | 12 kg |
| | |
| SLOPE MATERIALS | 0% min.* per sq. meter |
| INSULATION | |
| PARADIENE 20 SA P | 3.4 kg |
| PARAPRO ROOF RESIN | 2.0 kg |
| PRO FLEECE | |
| PARAPRO ROOF RESIN | 1.3 kg |

* Pro Thixo resin additive is required for systems applied on slopes in excess of 1 inch (8%).

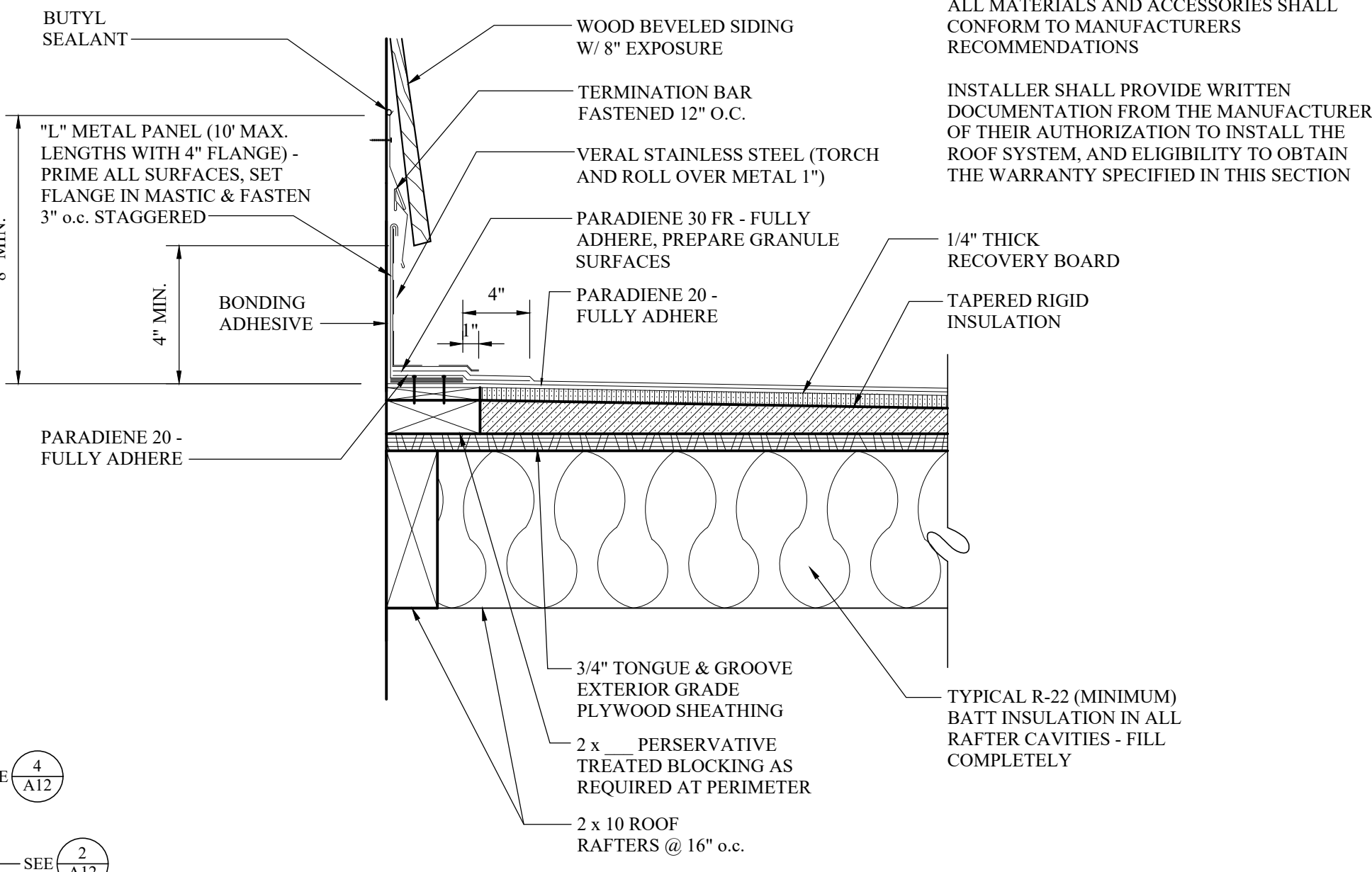
4 ROOF MEMBRANE SYSTEM

N. T. S.



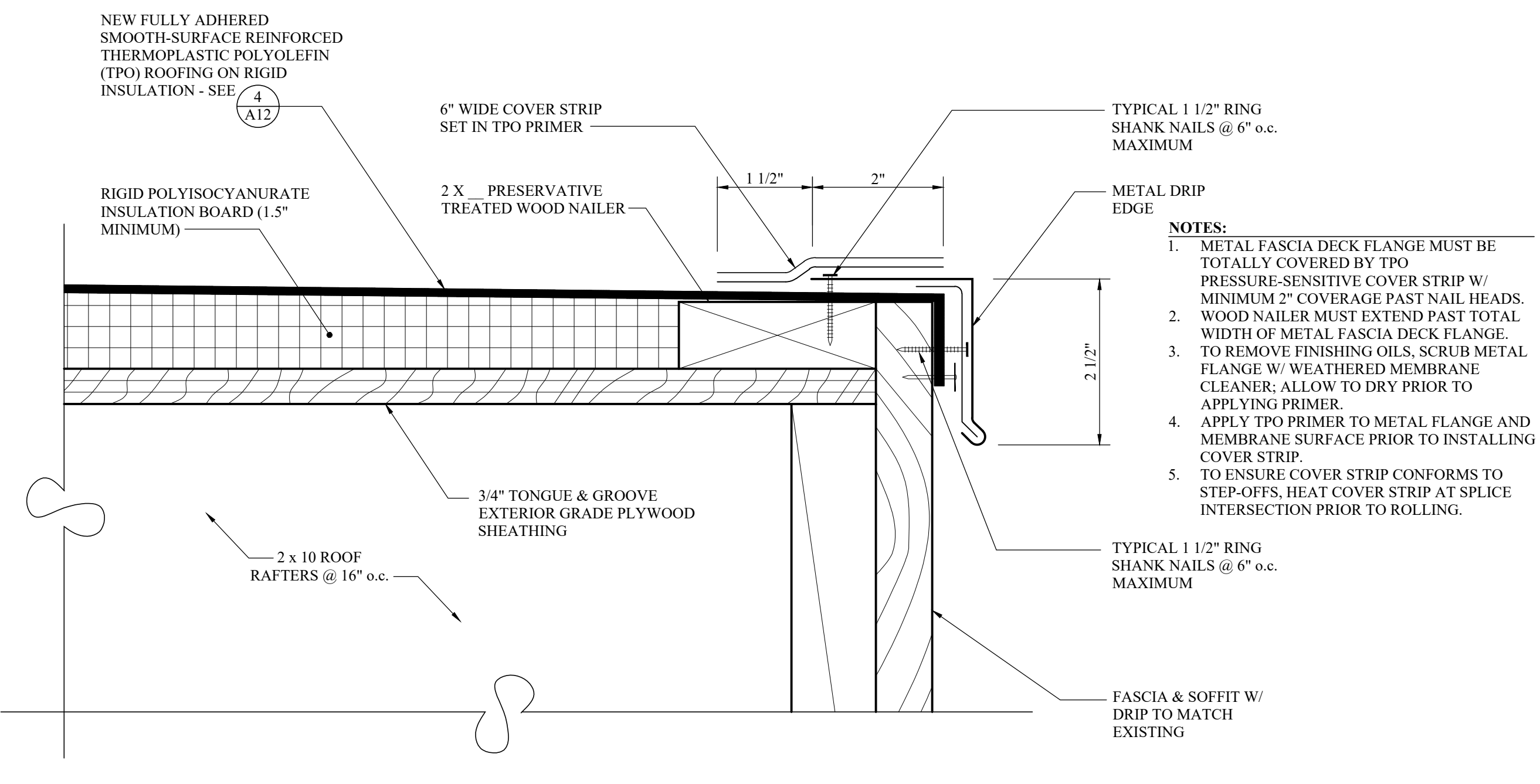
1 TYPICAL EAVE DETAIL @ LOWER GABLE

3" = 1' = 0"



5 BASE WALL FLASHING DETAIL

3" = 1' = 0"

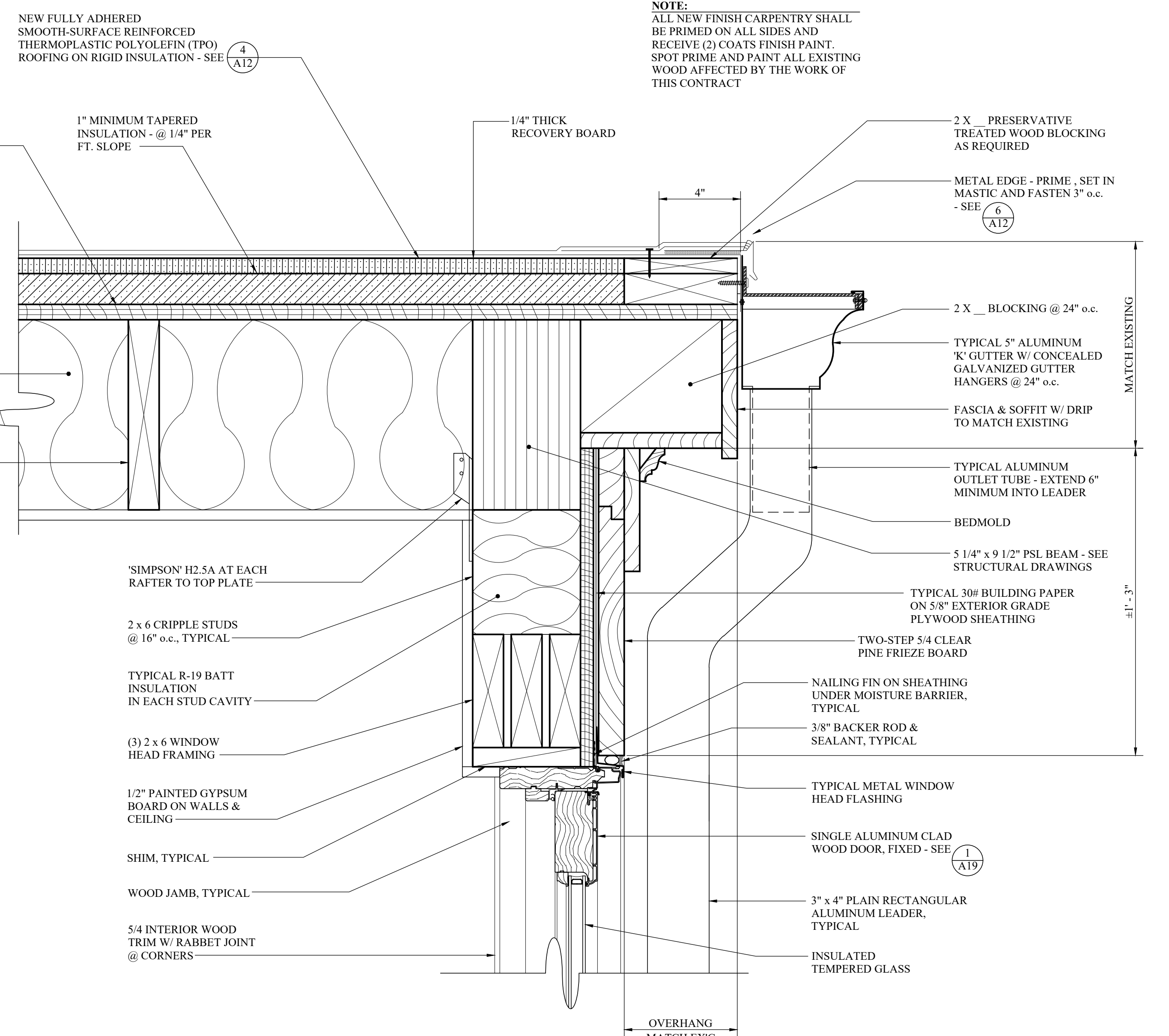


6 DRIP EDGE DETAIL @ FLAT ROOF

3" = 1' = 0"

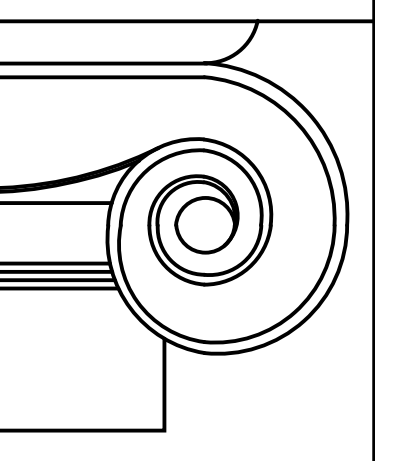
3 L-METAL JOINT DETAIL

N. T. S.



2 TYPICAL EAVE DETAIL @ LOWER GABLE

3" = 1' = 0"



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 NJ 21A10169200
 PA RA403776
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 NJ 21A1018244500

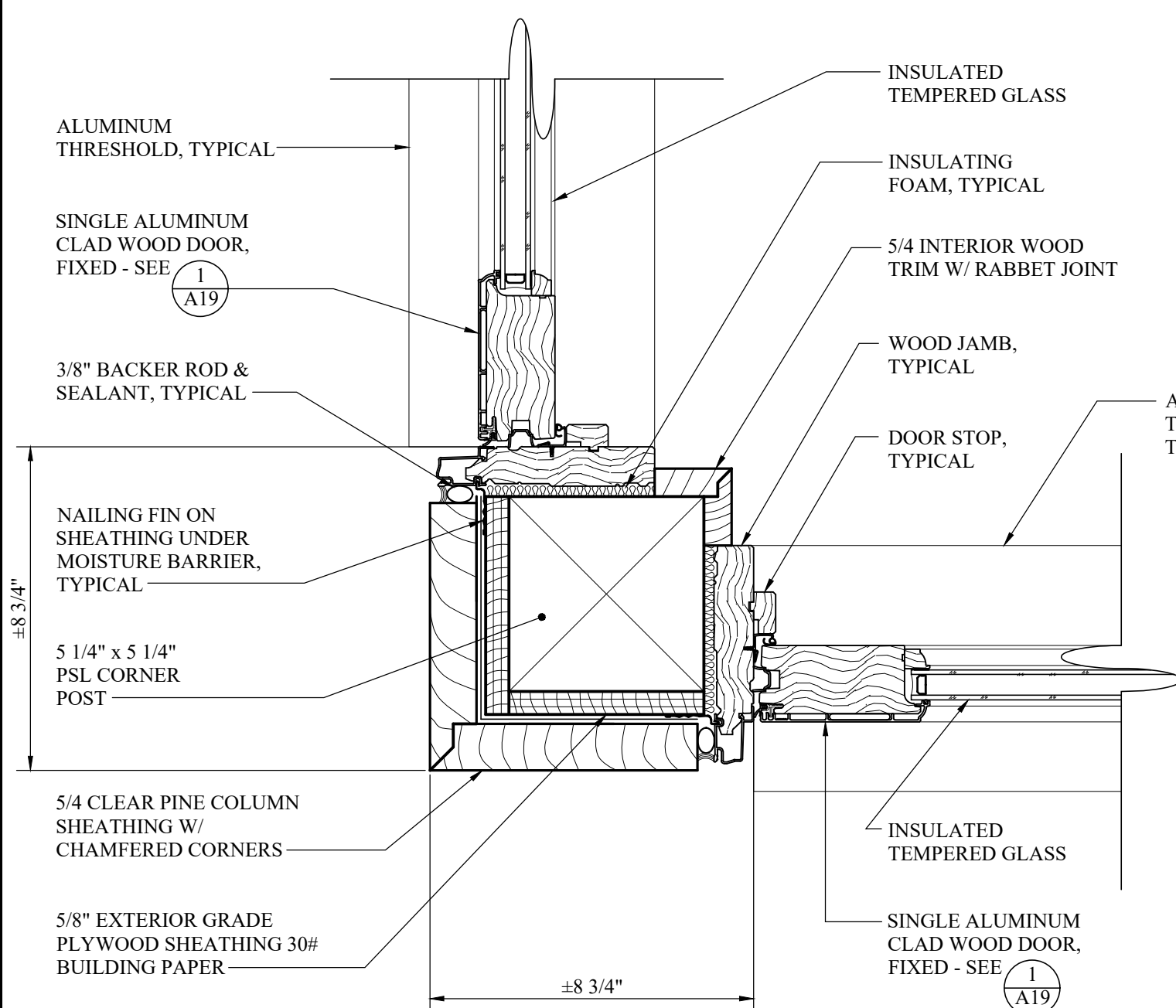
PROJECT No.: 1836C
 DATE: 30 June 2021

REVISIONS:

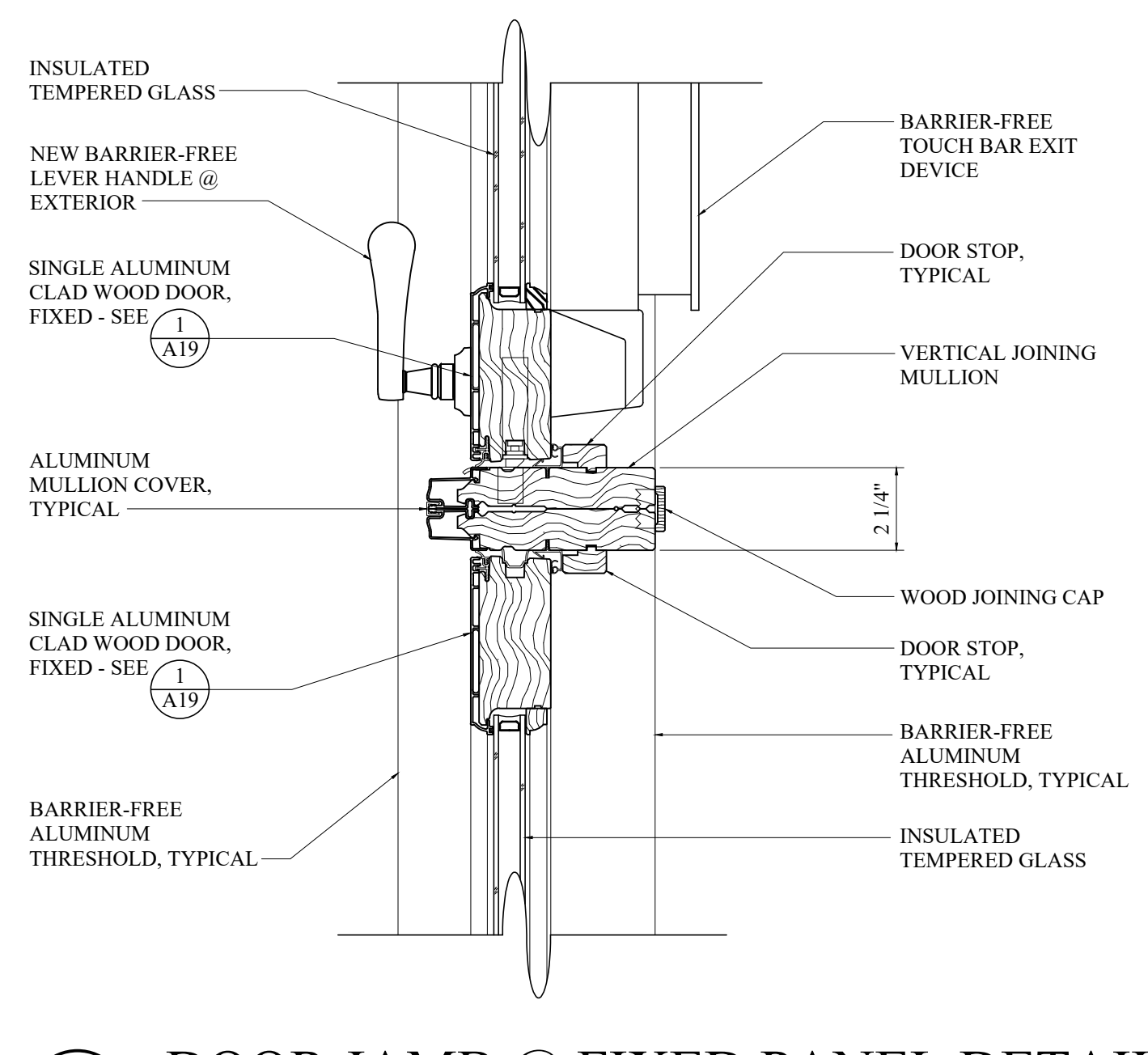
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RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
 TOWNSHIP OF PISCATAWAY
 MIDDLESEX COUNTY, NEW JERSEY

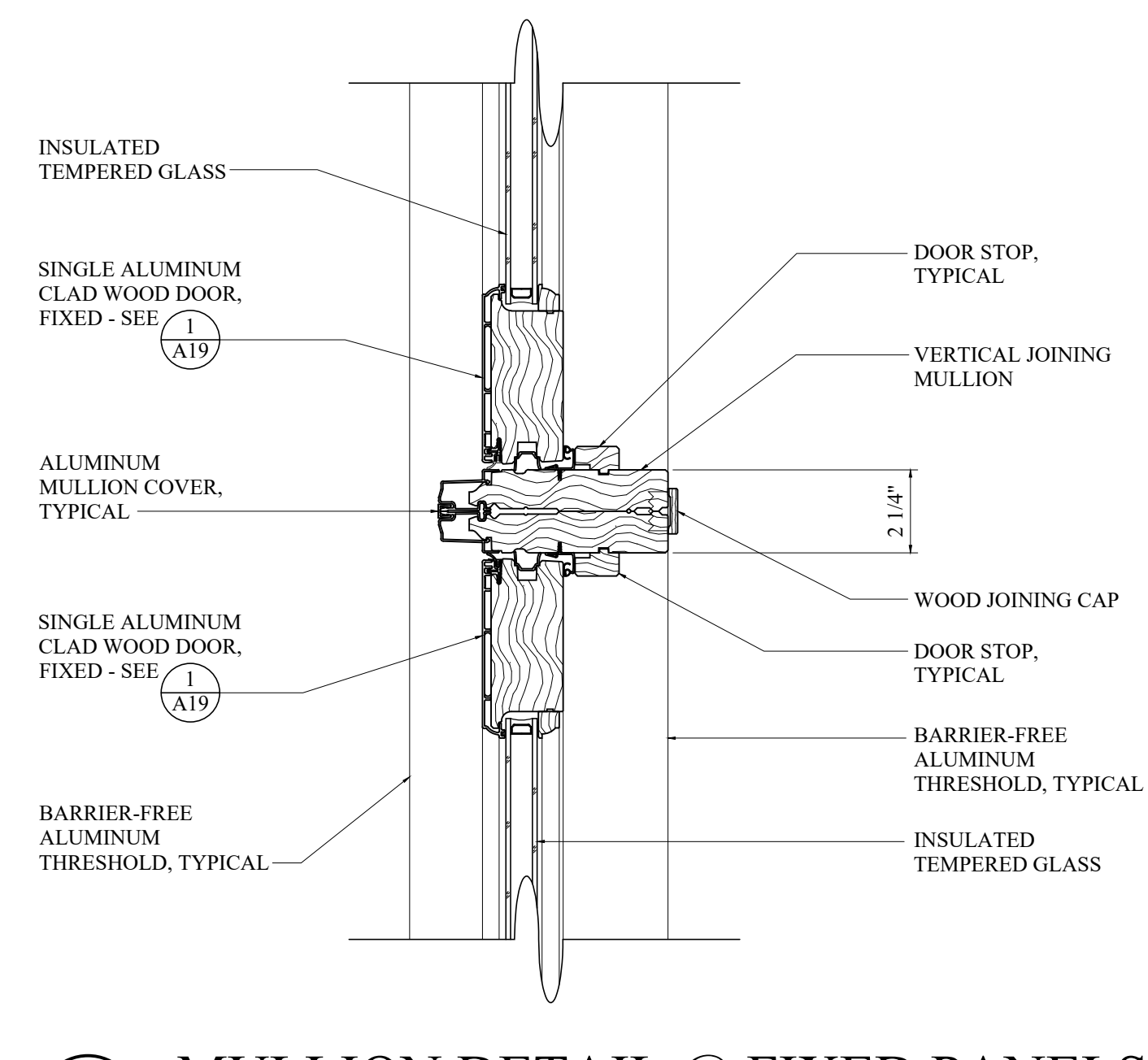
A12



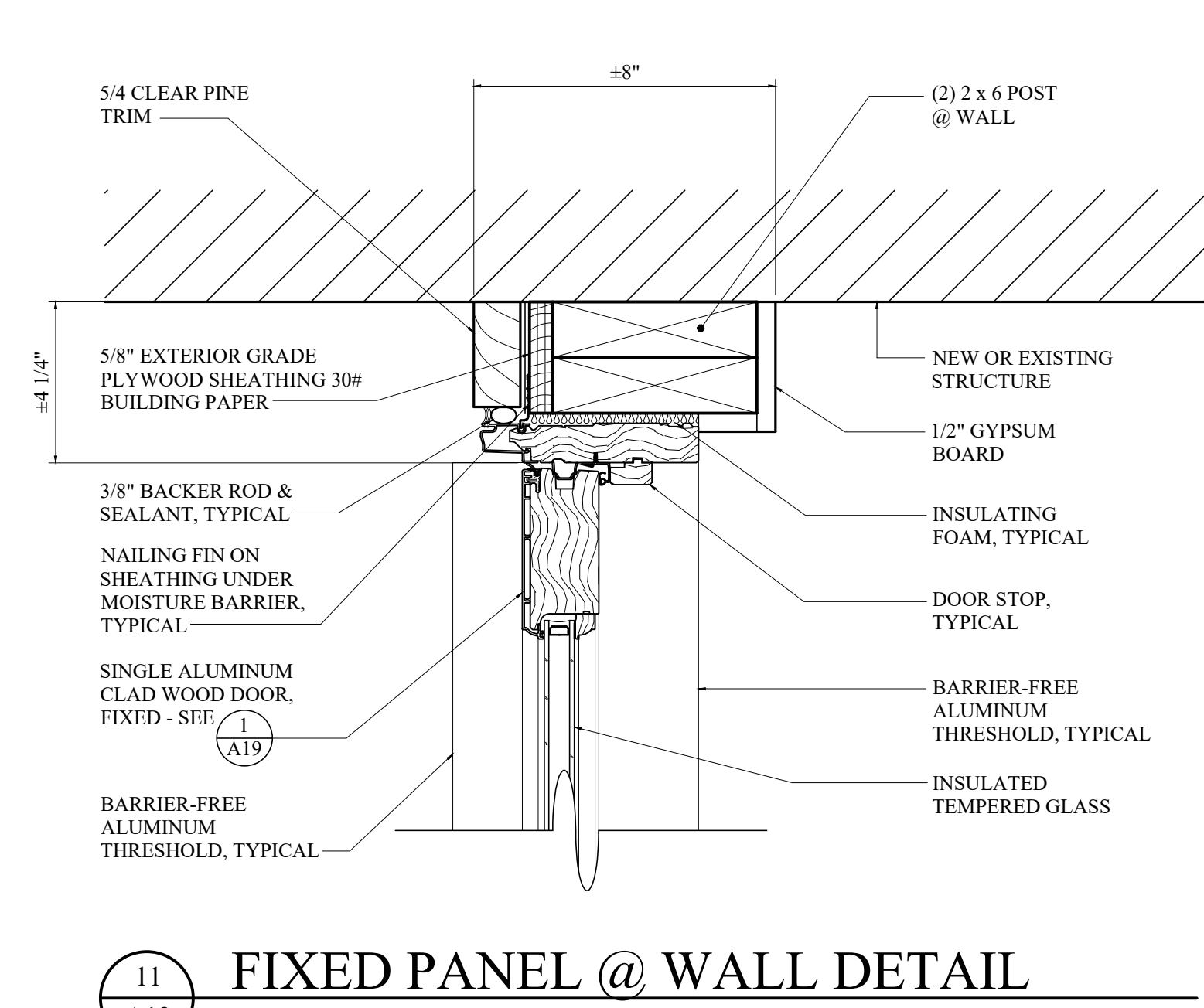
8 CORNER DETAIL @ FIXED PANELS
A13 3" = 1' 0"



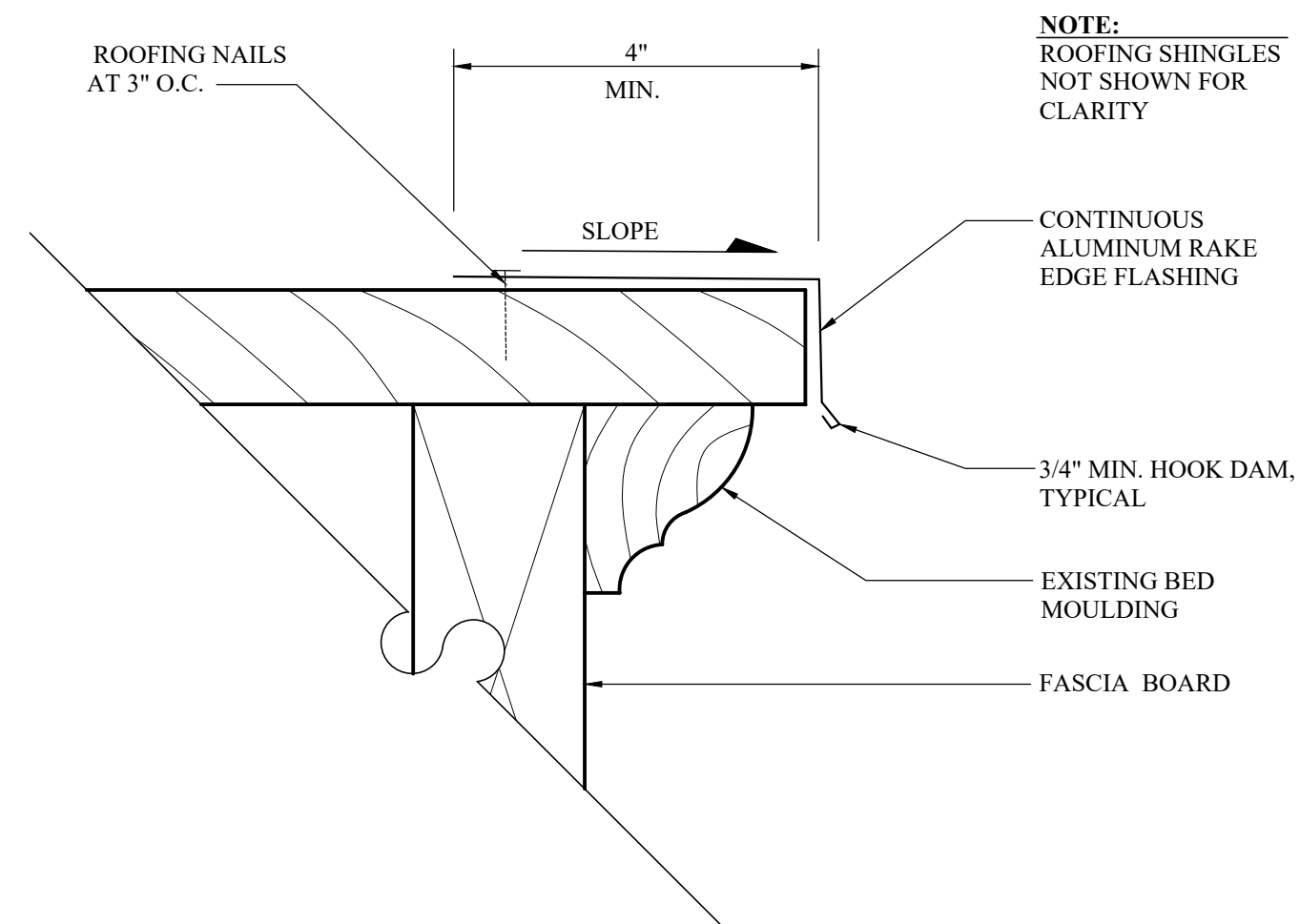
9 DOOR JAMB @ FIXED PANEL DETAIL
A13 3" = 1' 0"



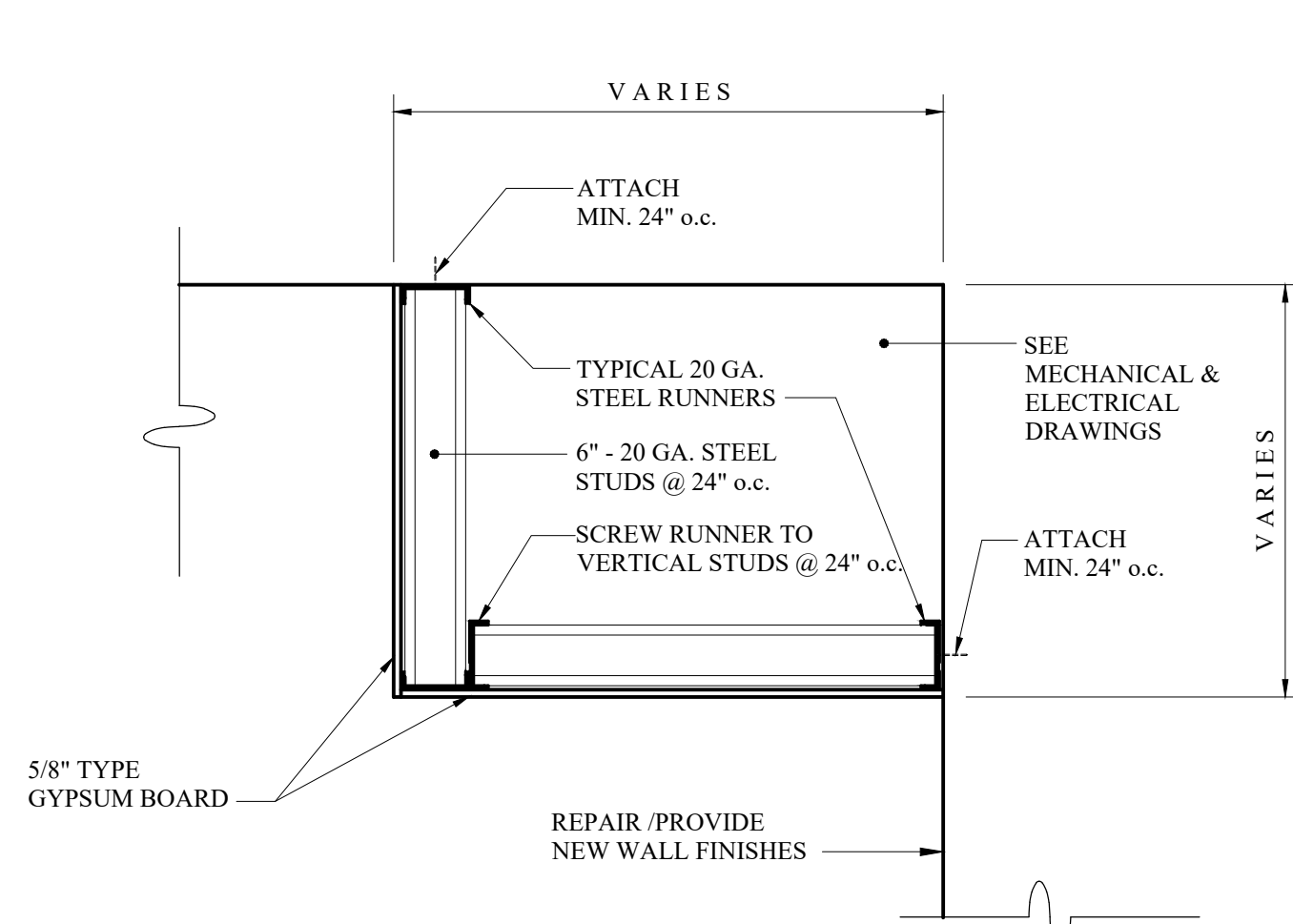
10 MULLION DETAIL @ FIXED PANELS
A13 3" = 1' 0"



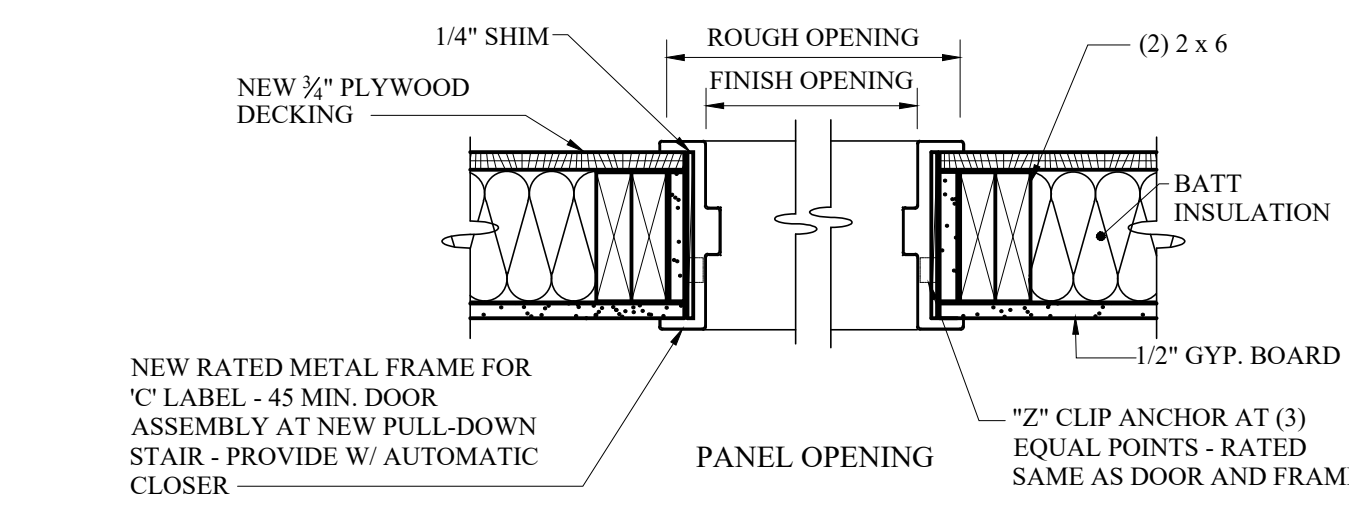
11 FIXED PANEL @ WALL DETAIL
A13 3" = 1' 0"



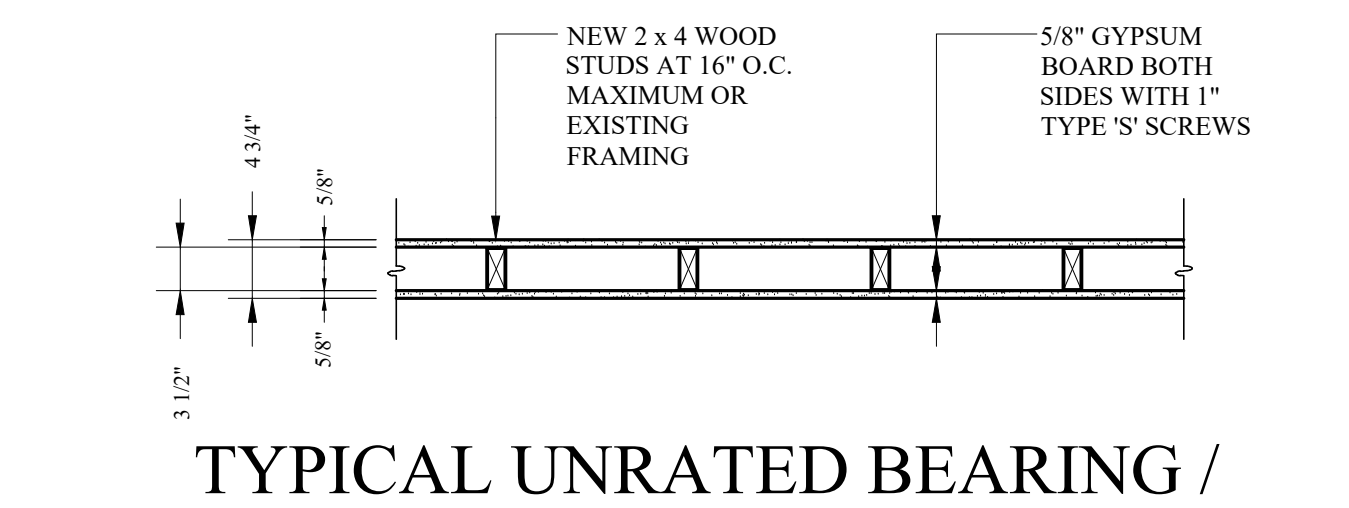
4 RAKE FLASHING DETAIL
A13 HALF SCALE



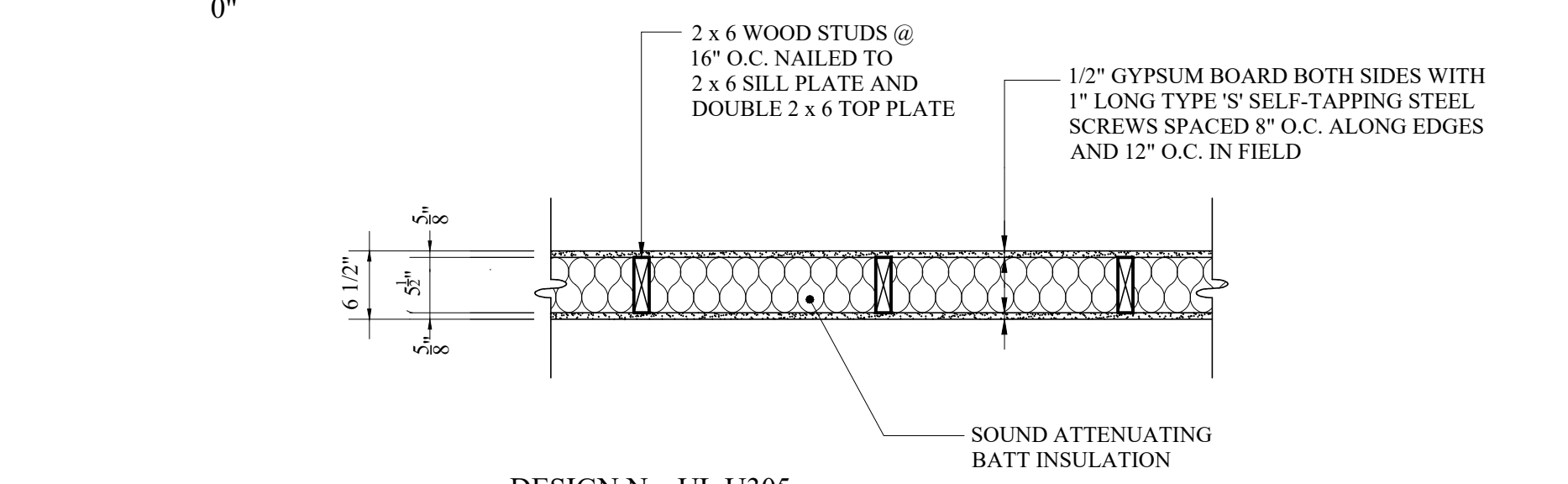
5 TYPICAL SOFFIT DETAIL
A13 N. T. S.



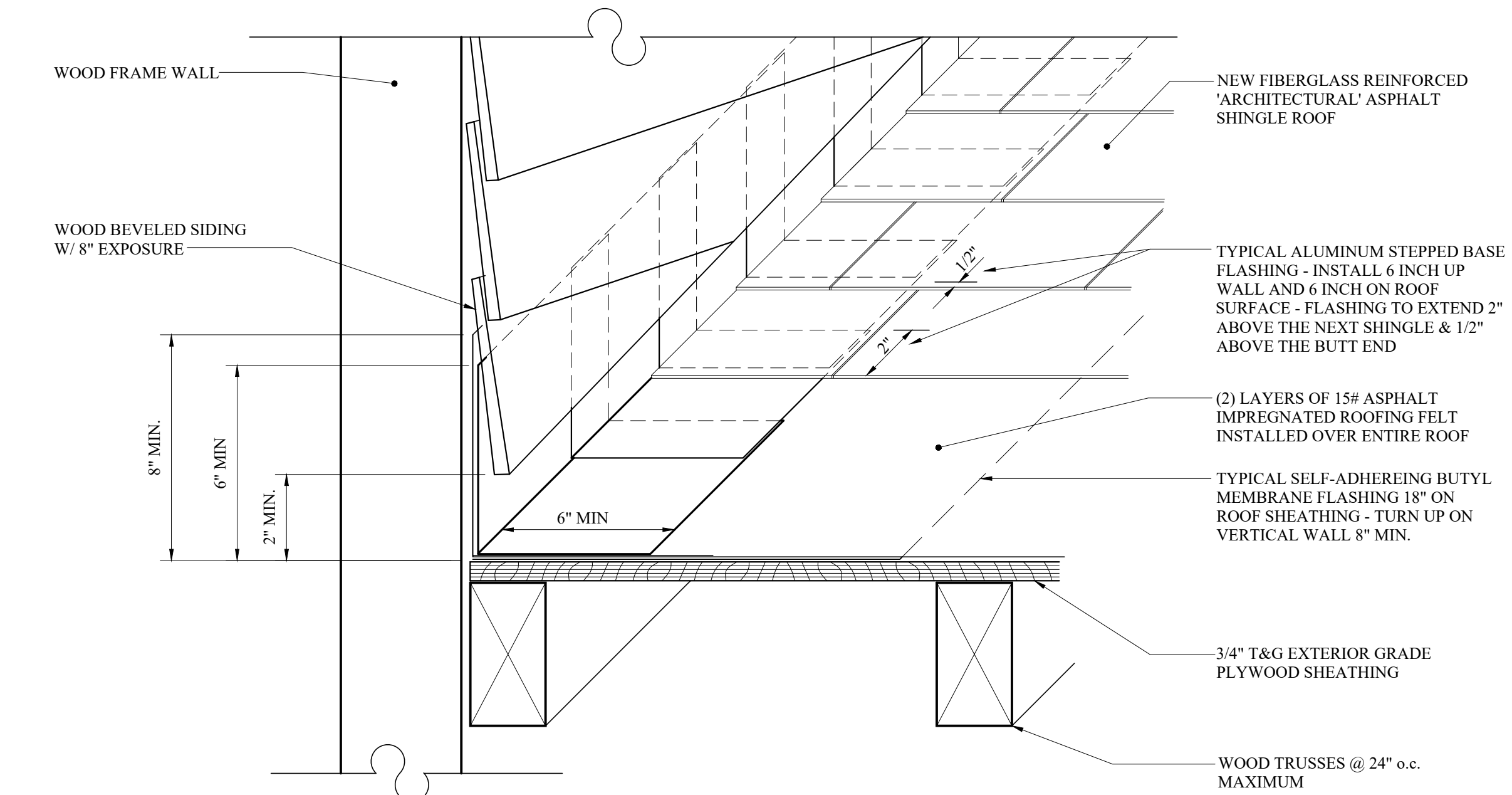
7 SECTION @ DROP-DOWN STAIR
A13 1 1/2" = 1' 0"



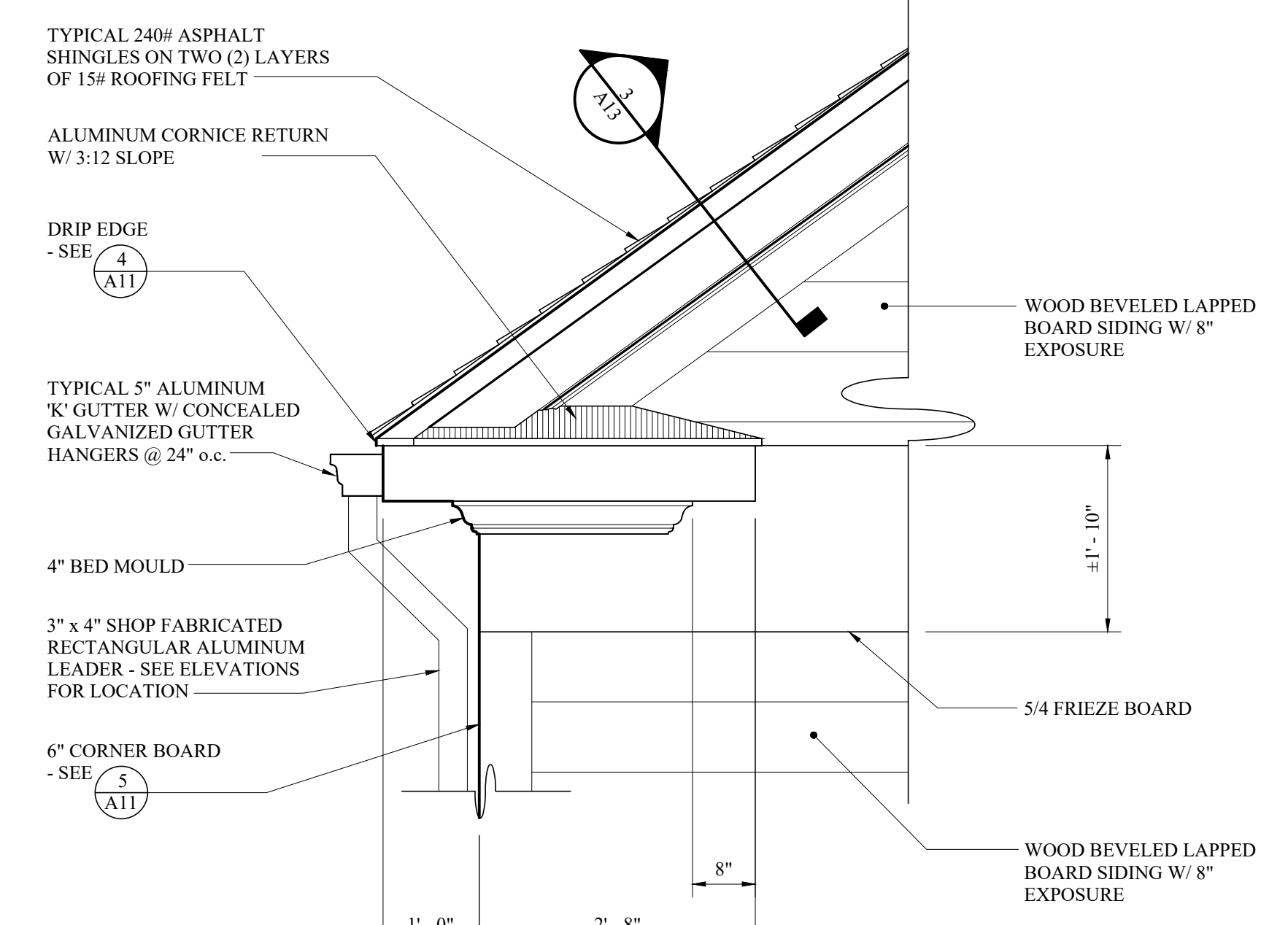
6 TYPICAL UNRATED BEARING / NON-BEARING PARTITION DETAIL
A13 3/4" = 1' 0"



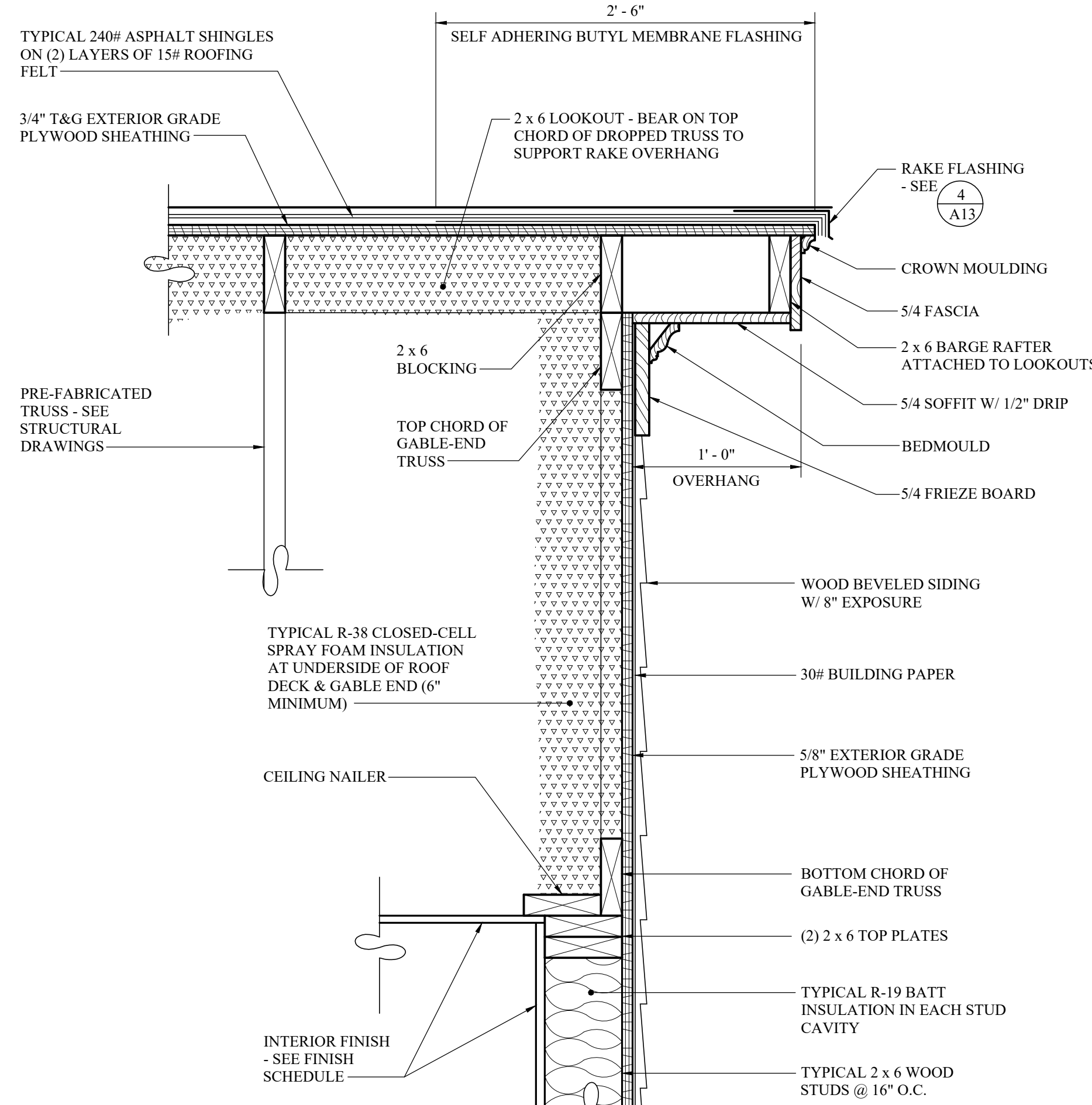
12 TYP. 1-HOUR BEARING PARTITION
A13 3/4" = 1' 0"



1 STEP FLASHING @ WOOD FRAME WALL DETAIL
A13 1 1/2" = 1' 0"



2 CORNICE EAVE RETURN DETAIL
A13 1 1/2" = 1' 0"



3 GABLE-END TRUSS DETAIL
A13 1 1/2" = 1' 0"

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NJ 21A1018244500

PROJECT No.: 1836C
DATE: 30 JUNE 2021

REVISIONS:

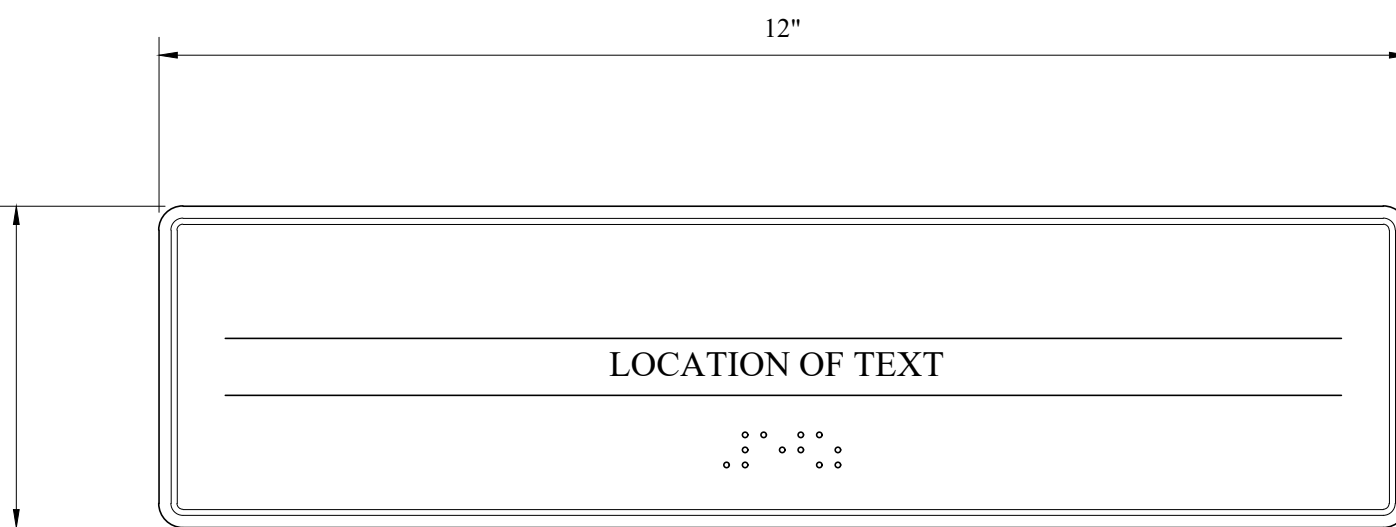
RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
TOWNSHIP OF PISCATAWAY
MIDDLESEX COUNTY, NEW JERSEY

A13

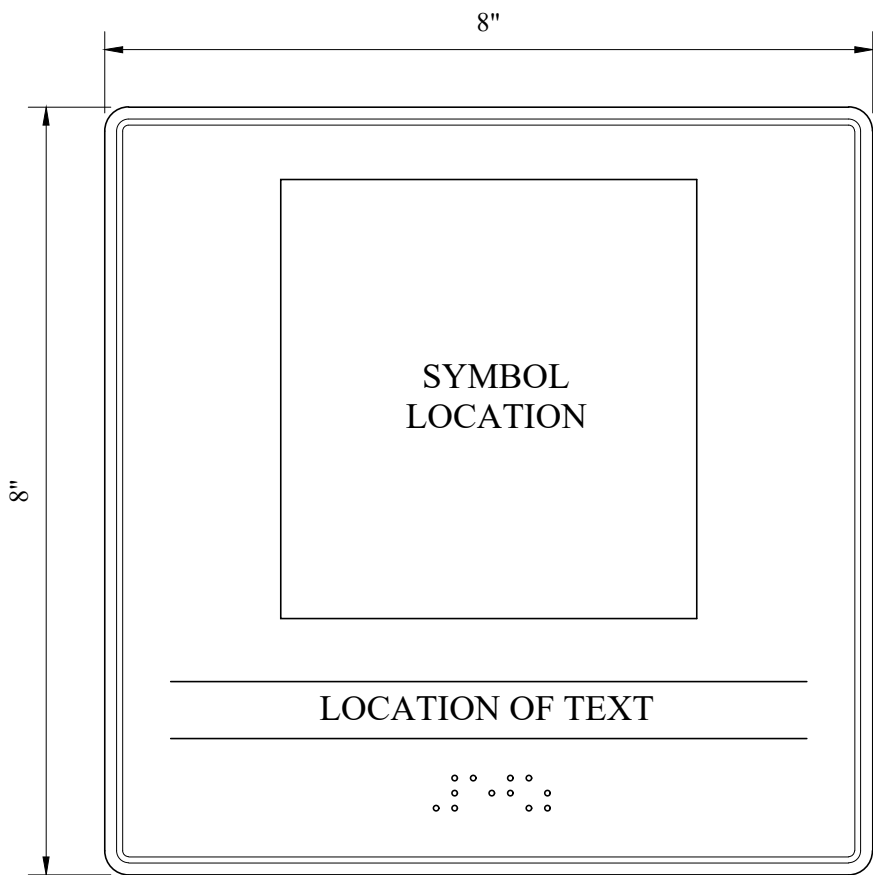
INTERIOR WORK NOTES AND KEY

- GENERAL NOTES:**
- THE CONTRACTOR IS RESPONSIBLE FOR PROTECTING ADJACENCIES (SUCH AS PEOPLE, LAWNS, WATER SOURCES, ETC.) DURING THE EXECUTION OF FINISH CARPENTRY REPAIRS AND SURFACE PREPARATION AND PAINTING.
 - PROVIDE ADEQUATE MEANS BY WHICH WORKERS AND THE ARCHITECT SHALL HAVE ACCESS TO THE INTERIOR OF THE BUILDING TO UNDERTAKE AND REVIEW THE WORK PROVIDING A SAFE WORKING ENVIRONMENT ACCORDING TO OSHA REQUIREMENTS AND OTHER REQUIREMENTS AS SET FORTH IN THE TECHNICAL SPECIFICATIONS.
 - GENERAL CONTRACTOR IS RESPONSIBLE FOR ALL NECESSARY DEMOLITION IN ALL AREAS WHERE NE WORK IS TO BE PERFORMED
 - ALL DEMOLITION WORK SHALL COMPLY WITH CONSTRUCTION INDUSTRY STANDARD PRACTICE AND TECHNIQUES.
 - ALL PIPING AND WIRING TO BE REMOVED SHALL BE DONE TO A POINT OF CONCEALMENT AND SHALL BE PROPERLY CAPPED OR PLUGGED.
 - GENERAL CONTRACTOR SHALL BE HELD RESPONSIBLE FOR THE STRUCTURAL INTEGRITY OF THE BUILDING. THE GC SHALL TAKE ALL PRECAUTIONS NECESSARY TO PREVENT DAMAGE STRUCTURAL ELEMENTS NO LEAD BEARING OR OTHER STRUCTURAL MEMBERS MAY BE REMOVED OR ALTERED EXCEPT WHERE NOTED.
 - THE GENERAL CONTRACTOR SHALL BE IMMEDIATELY REPORT ANY STRUCTURAL DEFECTS TO THE ARCHITECT.
 - THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE DESIGN AND CONSTRUCTION OF ALL SHORING/BRACING/TEMPORARY COVERING AS REQUIRED TO SUPPORT THE REMAINING STRUCTURE AND PROTECT IT FROM WEATHER PRIOR TO COMPLETION OF ANY NEW CONSTRUCTION ELEMENT.
 - THE GENERAL CONTRACTOR SHALL ABIDE BY ALL THE SAFETY RULES AND REGULATIONS STIPULATED IN LOCAL, STATE, AND OSHA REGULATIONS.
 - ALL SELECTIVE DEMOLITION WORK SHALL BE DONE CAREFULLY AND NEATLY, IN A SYSTEMATIC MANNER. THE CONTRACTOR SHALL CLEAN WORK AREA OF DEBRIS AT THE END OF EACH WORK DAY.
 - GENERAL CONTRACTOR IS RESPONSIBLE FOR COORDINATING ALL WORK BETWEEN THE TRADES PRIOR TO THE INSTALLATION OF INTERIOR FINISHES.
 - PROVIDE A MOCK-UP OF THE DIFFERENT TRIM AND BASE DETAILS WITH THE FLOORING, WINDOWS, AND DOORS (FOR EACH CONDITIONS) PRIOR TO ORDERING MATERIALS AND INSTALLATION.
 - ALL EXISTING OR PROPOSED ELEVATIONS (LEVELS) AND DIMENSIONS, ON SITE AND ON DRAWINGS MUST BE CHECKED AND VERIFIED BY THE CONTRACTOR BEFORE THE PREPARATION OF SHOP DRAWINGS OR COMMENCEMENT OF ANY ITEM OF WORK ON THE SITE.
 - ARCHITECTURAL DRAWINGS MUST ALWAYS BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT SERVICES DRAWINGS AND CONTRACT DOCUMENTS. ANY DISCREPANCY BETWEEN THESE DRAWINGS AND DOCUMENTS SHOULD BE REPORTED TO THE ARCHITECT FOR CLARIFICATION AND VERIFICATION.
 - ALL GYPSUM BOARD SURFACES SHALL BE RECEIVE PRIMER AND 2-COAT FINISH PAINT.
 - ALL NEW WOOD (BASE, WINDOW AND DOOR TRIM, ETC.) SHALL BE FULLY PRIMED (ALL SIDES) AND 2-COAT FINISH PAINT.
 - CONTRACTOR TO LOCATE ALL ACCESS PANEL IN THE GYPSUM BOARD CEILING FOR SERVICES ACCESS.
 - THE CONTRACTOR SHALL SUBMIT SAMPLES AND SHOP DRAWINGS FOR ALL WORKS WITH ALL NECESSARY DETAILS AND DESIGN INFORMATION FOR APPROVAL.
 - NOTES APPEARING ON VARIOUS DRAWINGS FOR DIFFERENT SYSTEMS AND MATERIALS ARE TO BE REVIEWED, COORDINATED AND ARE TO BE APPLIED TO ALL RELATED DRAWINGS AND DETAILS.
 - FIREBLOCKING SHALL BE PROVIDED TO CUT OFF ALL CONCEALED DRAFT OPENINGS (BOTH VERTICAL AND HORIZONTAL) AND TO FORM AN EFFECTIVE FIRE BARRIER BETWEEN STORIES, AND BETWEEN A TOP STORY AND THE ROOF SPACE. FIREBLOCKING SHALL BE PROVIDED IN WOOD FRAME CONSTRUCTION PER THE IBC.

NEW 5/8" GYPSUM WALLBOARDS AT WALLS / NEW 1/2" GYPSUM WALLBOARD AT CEILINGS. TAPE, SPACKLE, PRIME AND 2-COAT FINISH PAINT



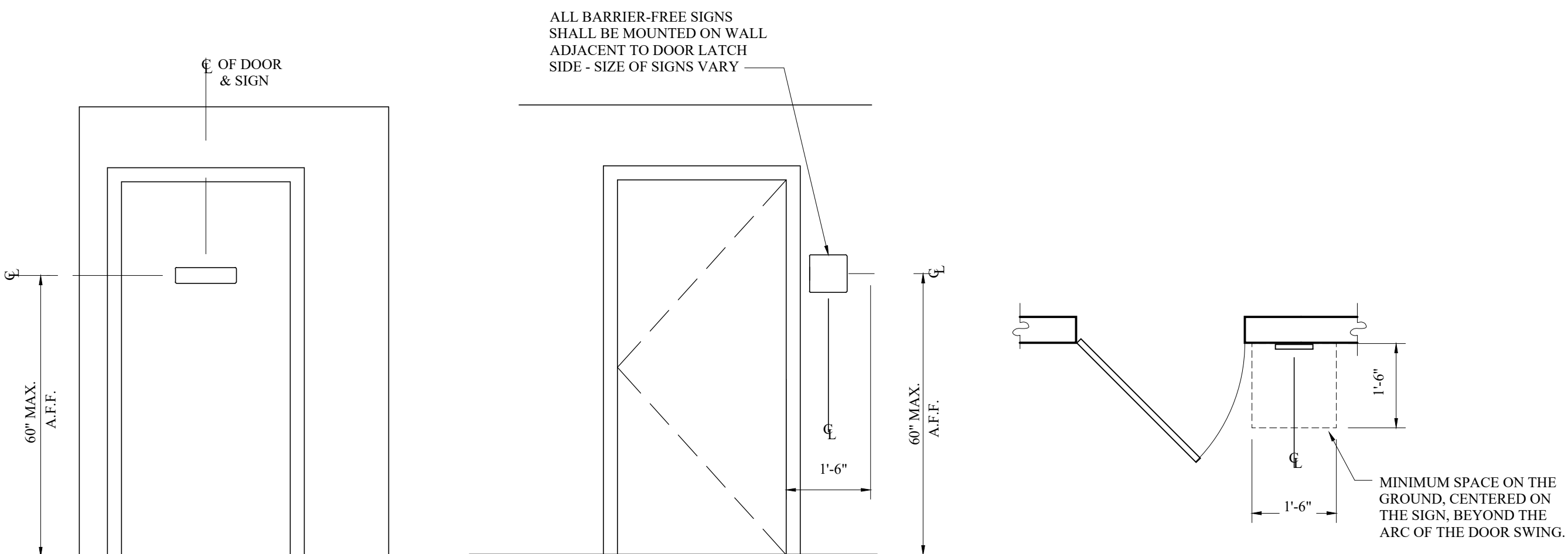
6 ROOM SIGN ON DOOR
A14 HALF SCALE



5 PICTOGRAM ROOM SIGN
A14 HALF SCALE



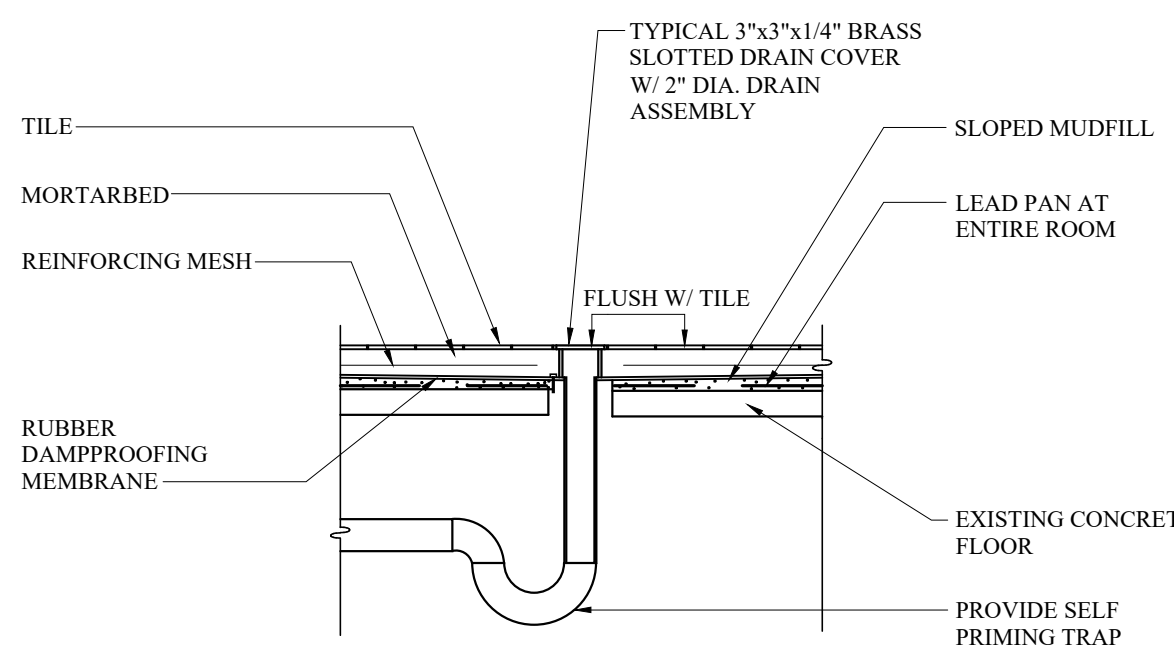
4 MAXIMUM OCCUPANCY SIGN
A14 HALF SCALE



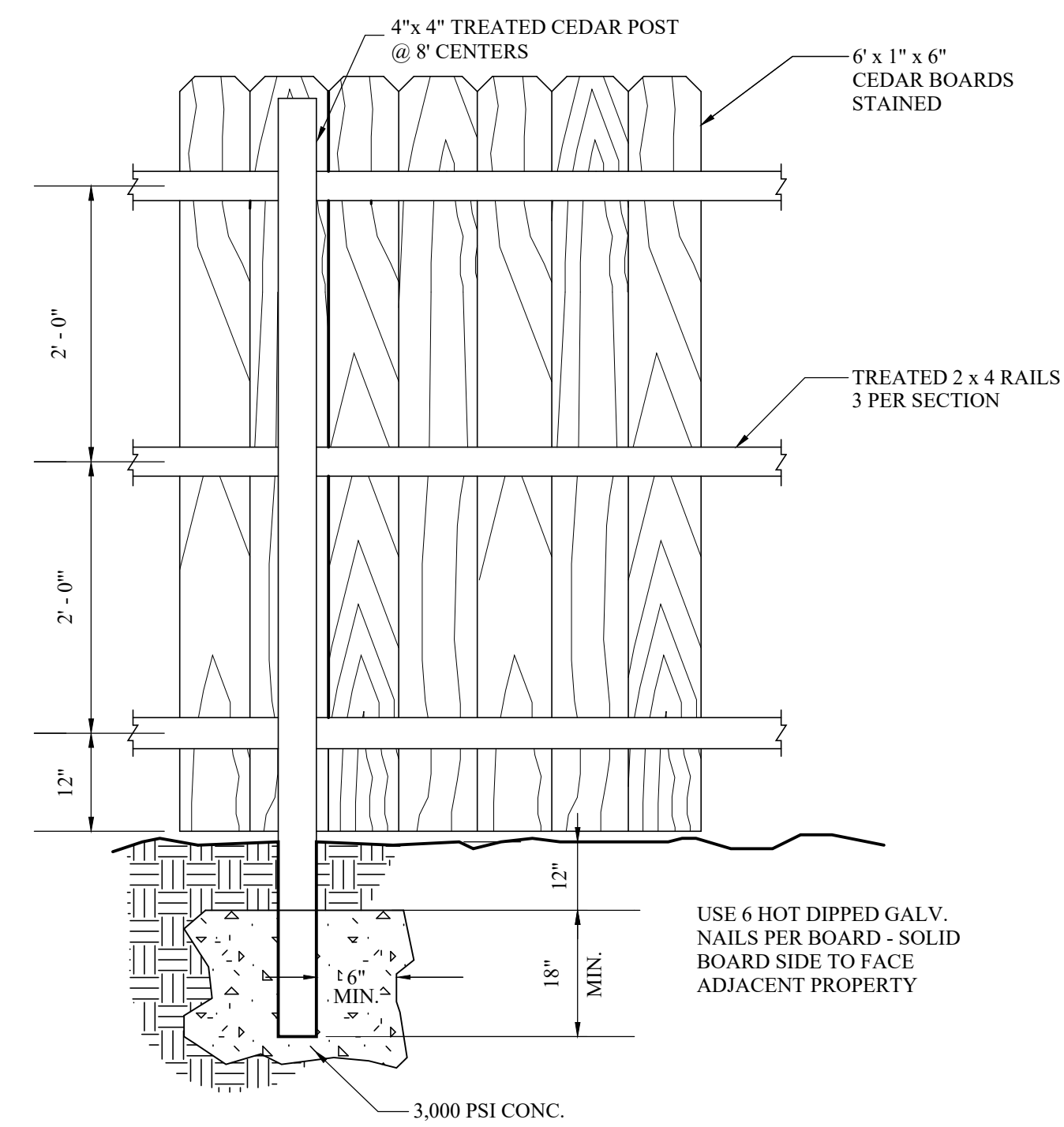
1 ROOM SIGN PLACEMENT REQUIREMENTS
A14 N. T. S.

FINISH SCHEDULE

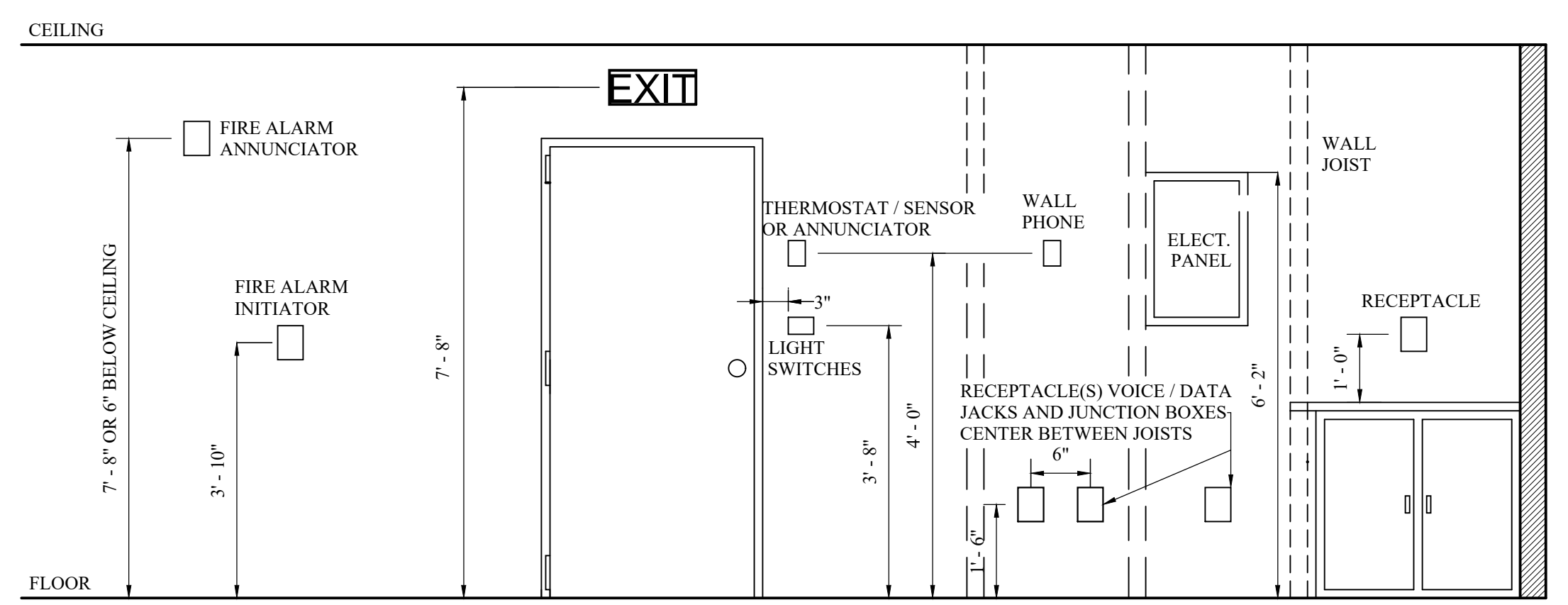
| ROOM NAME | FLOOR | WALLS | CEILING | BUILT-INS/TRIM | REMARKS |
|----------------------------|-------|--|--|---|---|
| FIRST FLOOR LEVEL | | | | | |
| VESTIBULE | | NEW CONCRETE - POLISHED & SEALED. FLOOR SURFACE MUST MEET ADA REQUIREMENTS FOR SLIP RESISTANCE - REFER TO TECHNICAL SPECIFICATIONS | NEW 5/8" GYPSUM WALLBOARD. TAPE, SPACKLE, PRIME AND 2-COAT FINISH PAINT | NEW 1/2" GYPSUM WALLBOARD. TAPE, SPACKLE, PRIME AND 2-COAT FINISH PAINT | NEW WOOD BASE TO MATCH WOOD TRIM AT EXISTING CORRIDOR. PRIME (ALL SIDES) AND 2-COAT FINISH PAINT |
| CORRIDOR | | NEW CONCRETE - POLISHED & SEALED. FLOOR SURFACE MUST MEET ADA REQUIREMENTS FOR SLIP RESISTANCE - REFER TO TECHNICAL SPECIFICATIONS. NOTE: REMOVE VINYL TILE AT EXISTING CORRIDOR, CLEAN AND APPLY POLISH AND SEALER TO MATCH BETWEEN NEW AND EXISTING CONCRETE | NEW 5/8" GYPSUM WALLBOARD. TAPE, SPACKLE, PRIME AND 2-COAT FINISH PAINT | NEW 1/2" GYPSUM WALLBOARD. TAPE, SPACKLE, PRIME AND 2-COAT FINISH PAINT. ALIGN NEW FINISHES WITH EXISTING CORRIDOR AND REPAINT ENTIRE CORRIDOR FOR COHESIVE APPEARANCE AT END OF PROJECT. | NEW WOOD BASE TO MATCH WOOD TRIM AT EXISTING CORRIDOR. PRIME (ALL SIDES) AND 2-COAT FINISH PAINT |
| ROSS HALL | | NEW CONCRETE - POLISHED & SEALED. FLOOR SURFACE MUST MEET ADA REQUIREMENTS FOR SLIP RESISTANCE - REFER TO TECHNICAL SPECIFICATIONS | NEW 5/8" GYPSUM WALLBOARD. TAPE, SPACKLE, PRIME AND 2-COAT FINISH PAINT | NEW 1/2" GYPSUM WALLBOARD. TAPE, SPACKLE, PRIME AND 2-COAT FINISH PAINT | NEW FLAT-STOCK WOOD BASE. SET SEMI-FLUSH WITH GYPSUM WALLBOARD FINISHES. PRIME (ALL SIDES) AND 2-COAT FINISH PAINT. - SEE (3) A18 |
| CLOSET 1 | | NEW CONCRETE - POLISHED & SEALED. FLOOR SURFACE MUST MEET ADA REQUIREMENTS FOR SLIP RESISTANCE - REFER TO TECHNICAL SPECIFICATIONS | NEW 5/8" GYPSUM WALLBOARD. TAPE, SPACKLE, PRIME AND 2-COAT FINISH PAINT | NEW 1/2" GYPSUM WALLBOARD. TAPE, SPACKLE, PRIME AND 2-COAT FINISH PAINT | NEW 4" FLAT-STOCK WOOD TRIM. PRIME (ALL SIDES) AND 2-COAT FINISH PAINT. |
| KITCHEN (INCLUDING CLOSET) | | NEW CONCRETE WITH NON-SLIP COATING - REFER TO TECHNICAL SPECIFICATIONS. | NEW 5/8" GYPSUM WALLBOARD. TAPE, SPACKLE, PRIME AND 2-COAT FINISH PAINT. APPLY NEW FRP PANELS TO 8 FOOT WAINSCOT HEIGHT FOR EASY-CLEAN SURFACE. COVER PANELS WITH PLASTIC COVERS PROVIDED BY FRP PANEL MANUFACTURER. | NEW 1/2" GYPSUM WALLBOARD. TAPE, SPACKLE, PRIME AND 2-COAT FINISH PAINT | CARRY FRP PANELS TO THE FLOOR AND INSTALL QUARTER-ROUND AT FLOOR TRANSITION. PRIME AND 2-COAT FINISH PAINT QUARTER-ROUND. |
| UTILITY | | NEW CONCRETE - POLISHED & SEALED. FLOOR SURFACE MUST MEET ADA REQUIREMENTS FOR SLIP RESISTANCE - REFER TO TECHNICAL SPECIFICATIONS | NEW 5/8" GYPSUM WALLBOARD. TAPE, SPACKLE, PRIME AND 2-COAT FINISH PAINT | NEW 1/2" GYPSUM WALLBOARD. TAPE, SPACKLE, PRIME AND 2-COAT FINISH PAINT | NEW 4" VINYL BASE IN BLACK. |
| CLOSET 2 | | NEW CONCRETE - POLISHED & SEALED. FLOOR SURFACE MUST MEET ADA REQUIREMENTS FOR SLIP RESISTANCE - REFER TO TECHNICAL SPECIFICATIONS | NEW 5/8" GYPSUM WALLBOARD. TAPE, SPACKLE, PRIME AND 2-COAT FINISH PAINT | NEW 1/2" GYPSUM WALLBOARD. TAPE, SPACKLE, PRIME AND 2-COAT FINISH PAINT | NEW 4" VINYL BASE IN BLACK. |



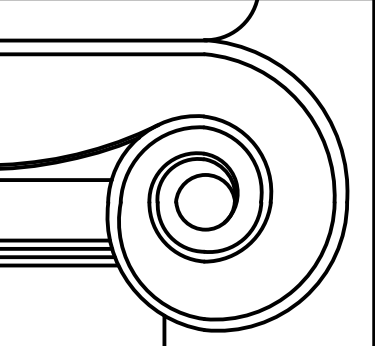
3 FLOOR DRAIN DETAIL
A14 N. T. S.



7 WOOD FENCE DETAIL
A14 N. T. S.



2 TYPICAL MOUNTING HEIGHTS
A14 N. T. S.



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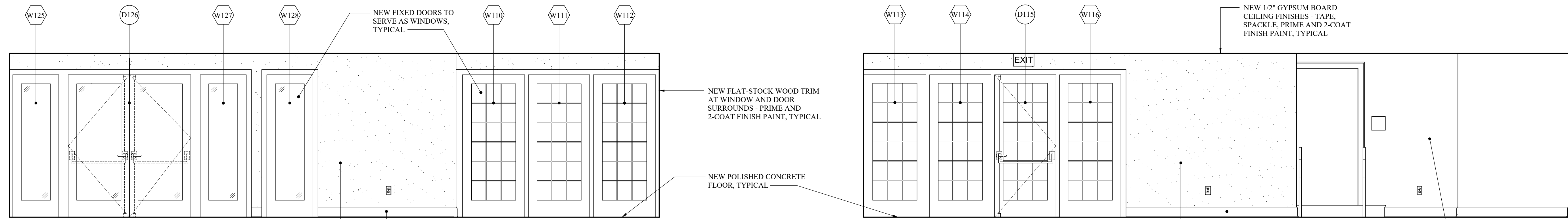
THOMAS B. CONNOLLY, AIA
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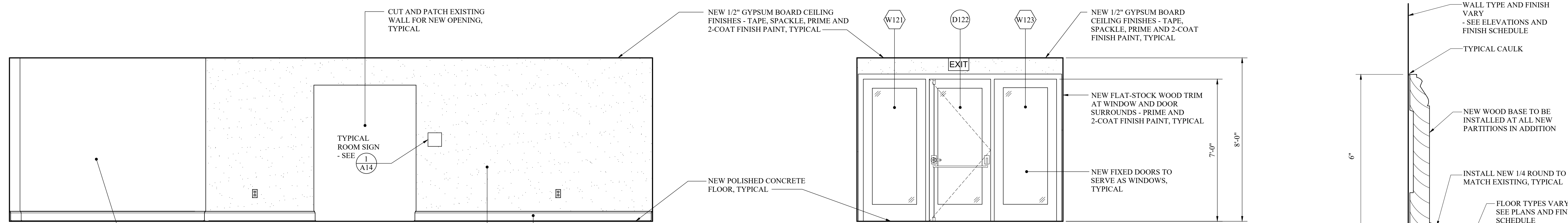
RESTORATION & EXPANSION
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A14



C NORTH

D EAST

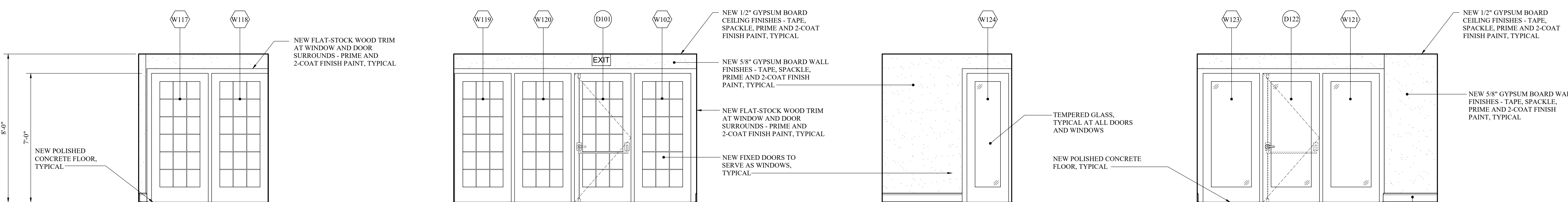


A SOUTH

B WEST

3 TYP. WOOD BASE
A15 HALF SCALE

2 CORRIDOR - INTERIOR ELEVATIONS
A15 3/8" = 1' 0"



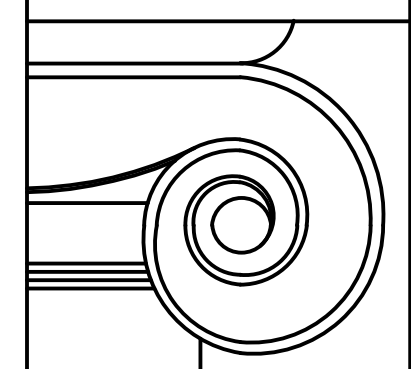
A SOUTH

B WEST

C NORTH

D EAST

1 VESTIBULE - INTERIOR ELEVATIONS
A15 3/8" = 1' 0"



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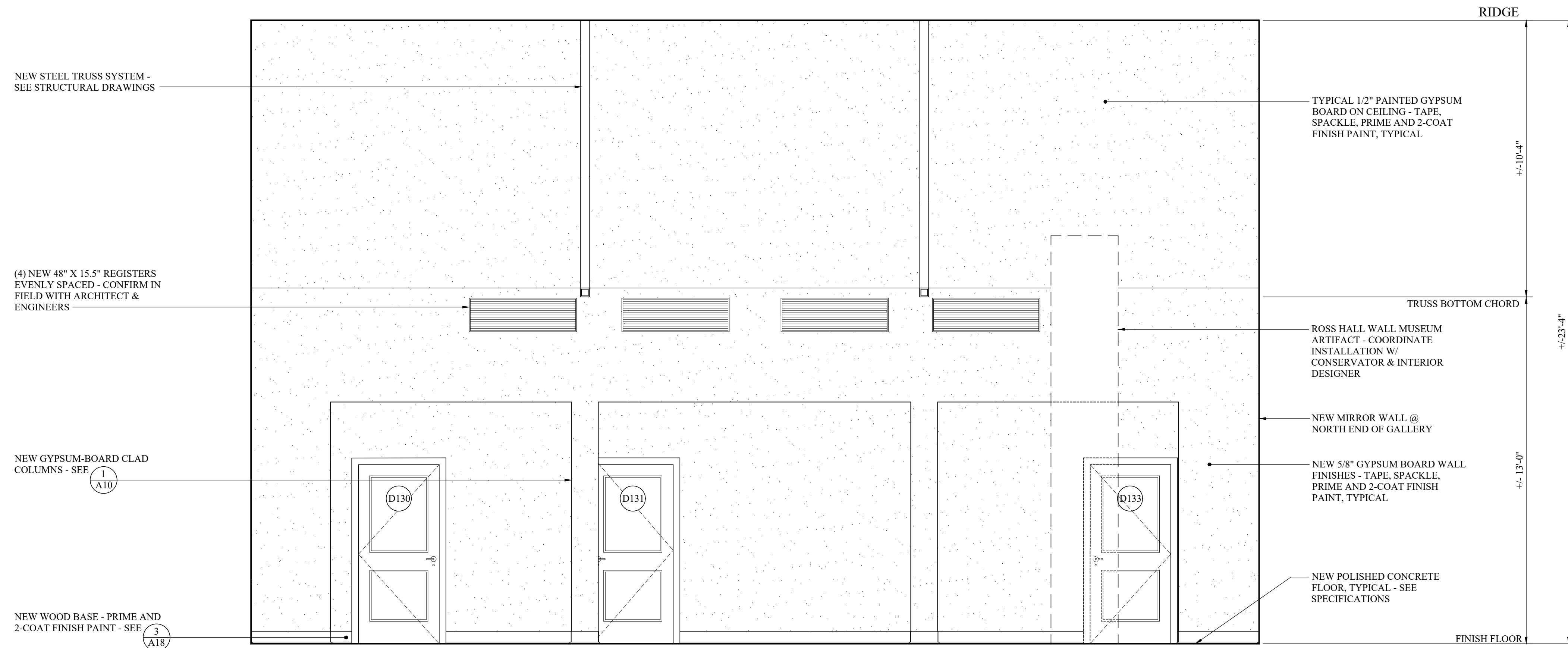
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A15



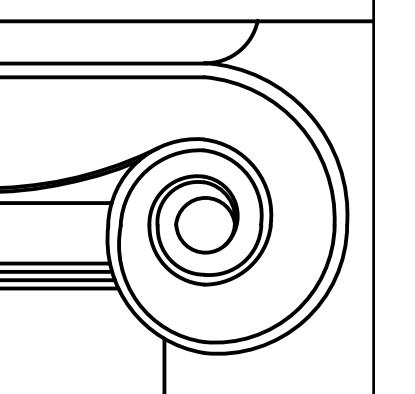
(B) WEST



(A) SOUTH

1 GALLERY - INTERIOR ELEVATIONS

A16 3/8" = 1' - 0"



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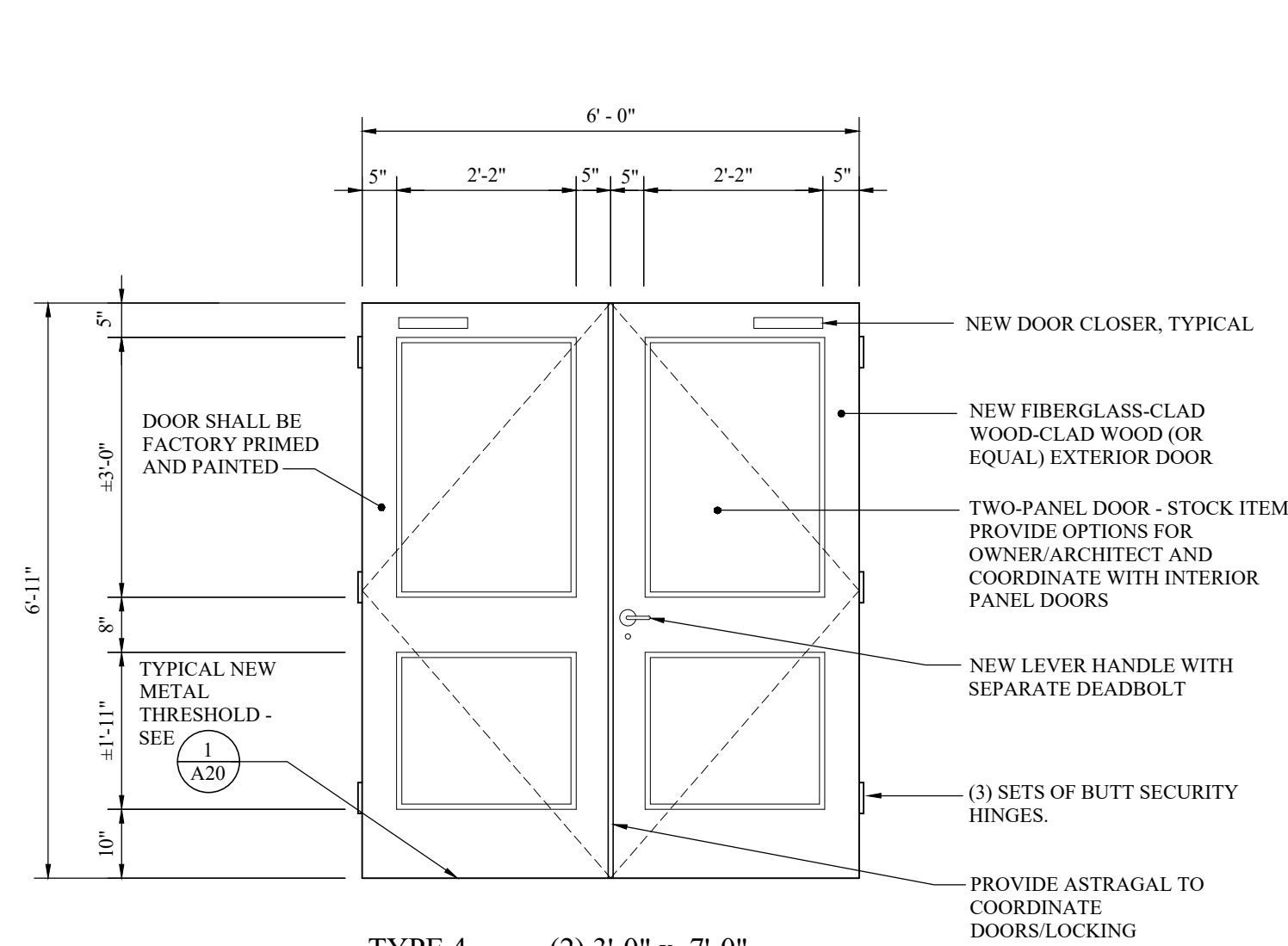
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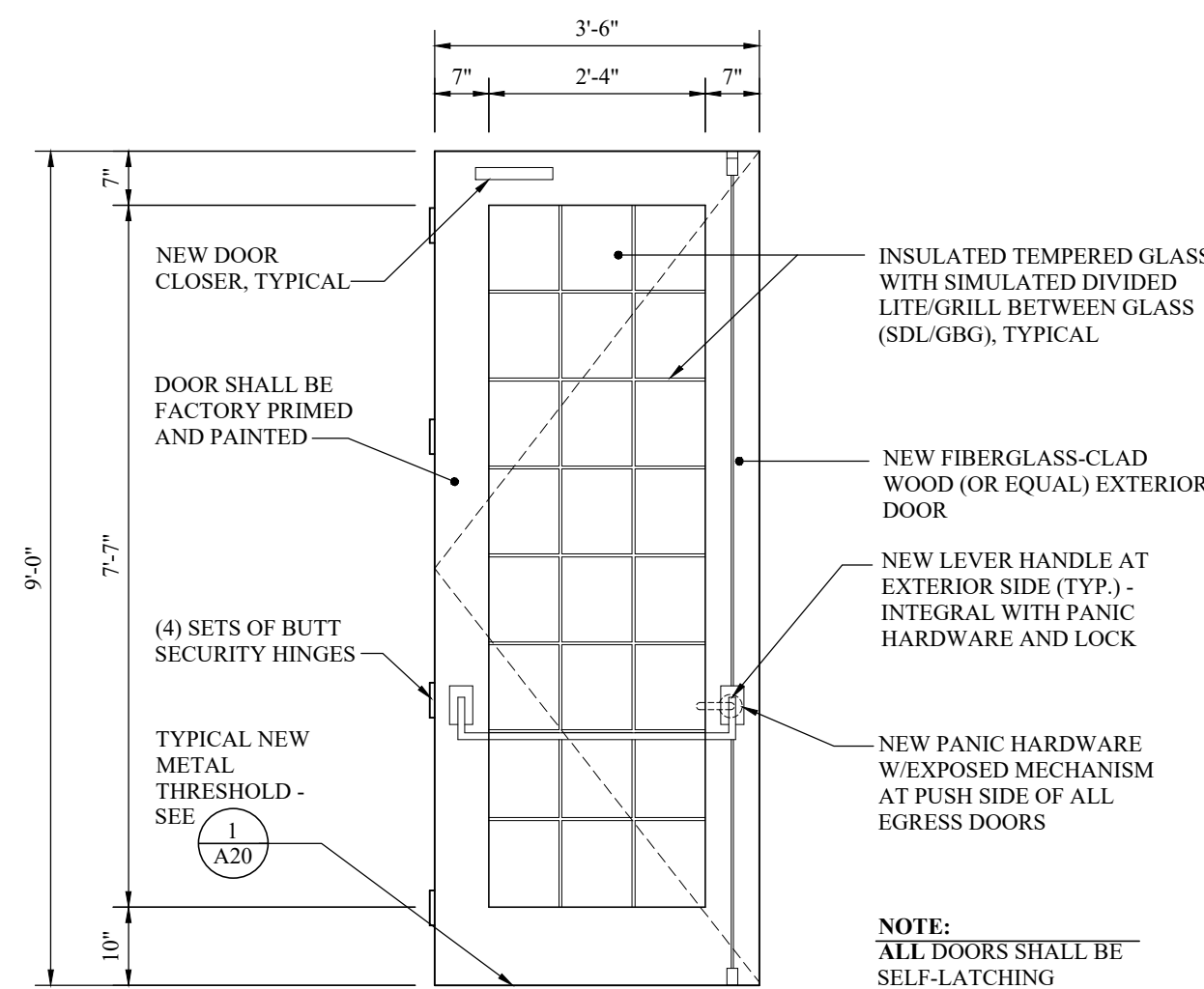
A16

DOOR SCHEDULE

| DOOR NO | TYPE | DOOR SIZE | FRAME | LEAF | FINISH | APPLICABLE RATING | BUCK & SILL DETAILS | REMARKS | SIGNAGE | DOOR NO | TYPE | DOOR SIZE | FRAME | LEAF | FINISH | APPLICABLE RATING | BUCK & SILL DETAILS | REMARKS | SIGNAGE |
|---------------------|--------|-------------------------|----------|---|--|-------------------|---------------------|---|---------|---|--------|-------------------------|-----------|--|---|-------------------|---------------------|---|---------------|
| GROUND FLOOR | | | | | | | | | | GROUND FLOOR | | | | | | | | | |
| D101 | TYPE 1 | +/-3' 0" x +/-7' 0" | NEW WOOD | 18-LITE FIBERGLASS-CLAD WOOD (OR EQUAL) EXTERIOR DOOR | ALL SIDES OF DOOR FACTORY PRIMED AND PAINTED. BACK PRIME AND (2) COAT FINISH PAINT FRAME | N/A | 9/A13 & 1/A12 | ALL GLASS SHALL BE INSULATED TEMPERED (SAFETY) GLASS WITH SIMULATED DIVIDED LITE/GRILL BETWEEN GLASS (SDL/GBG). | NONE | D122 | TYPE 2 | +/-3' 0" x +/-7' 0" | NEW WOOD | ONE-LITE WOOD (SPANISH CEDAR OR EQUAL) INTERIOR DOOR (TO MATCH PROFILE/SIZE OF EXTERIOR DOOR) | SURFACE PREPARE, PRIME, AND (2) COAT FINISH PAINT ALL 6 SIDES OF DOOR | N/A | 9/A13 & 1/A12 | ALL GLASS SHALL BE TEMPERED (SAFETY) GLASS | NONE |
| D103 | TYPE 4 | (2) +/-3' 0" x +/-7' 0" | NEW WOOD | (2) TWO-PANEL EXTERIOR DOOR - STOCK ITEM - PROVIDE OPTIONS FOR OWNER/ARCHITECT AND COORDINATE WITH INTERIOR PANEL DOORS | ALL SIDES OF DOOR FACTORY PRIMED AND PAINTED. BACK PRIME AND (2) COAT FINISH PAINT FRAME | N/A | 2/A20 & 1/A20 | PROVIDE ASTRAGAL TO COORDINATE DOORS/LOCKING | NONE | D126 | TYPE 3 | (2) +/-3' 0" x +/-7' 0" | NEW METAL | (2) ONE-LITE WOOD (SPANISH CEDAR OR EQUAL) INTERIOR DOOR (TO MATCH PROFILE/SIZE OF EXTERIOR DOOR) | SURFACE PREPARE, PRIME, AND (2) COAT FINISH PAINT ALL 6 SIDES OF DOOR | N/A | 4/A20 & 1/A20 | ALL GLASS SHALL BE TEMPERED (SAFETY) GLASS 20 MINUTE - 'C' LABEL | ASSEMBLY ROOM |
| D104 | TYPE 7 | +/-3' 0" x +/-6' 8" | NEW WOOD | FIBERGLASS-CLAD WOOD EXTERIOR DOOR - PROVIDE STOCK DOOR WITH SIMILAR PROFILE TO OTHER EXTERIOR DOORS | ALL SIDES OF DOOR FACTORY PRIMED AND PAINTED. BACK PRIME AND (2) COAT FINISH PAINT FRAME | N/A | 2/A20 & 1/A20 | | NONE | D129 | TYPE 6 | +/-3' 0" x +/-6' 8" | NEW WOOD | TWO-PANEL WOOD DOOR (SPANISH CEDAR OR EQUAL) - PROVIDE STOCK DOOR WITH SIMILAR PROFILE TO OTHER INTERIOR DOORS | SURFACE PREPARE, PRIME, AND (2) COAT FINISH PAINT ALL 6 SIDES OF DOOR | N/A | 3/A20 & 1/A20 | | CLOSET |
| D105 | TYPE 7 | +/-3' 0" x +/-6' 8" | NEW WOOD | TWO-PANEL FIBERGLASS-CLAD WOOD EXTERIOR DOOR - PROVIDE STOCK DOOR WITH SIMILAR PROFILE TO OTHER EXTERIOR DOORS | ALL SIDES OF DOOR FACTORY PRIMED AND PAINTED. BACK PRIME AND (2) COAT FINISH PAINT FRAME | N/A | 2/A20 & 1/A20 | | NONE | D130 | TYPE 6 | +/-3' 0" x +/-6' 8" | NEW WOOD | TWO-PANEL WOOD DOOR (SPANISH CEDAR OR EQUAL) - PROVIDE STOCK DOOR WITH SIMILAR PROFILE TO OTHER INTERIOR DOORS | SURFACE PREPARE, PRIME, AND (2) COAT FINISH PAINT ALL 6 SIDES OF DOOR | N/A | 4/A20 & 1/A20 | | CLOSET |
| D107 | TYPE 5 | +/-3' 0" x +/-9' 0" | NEW WOOD | 24-LITE FIBERGLASS-CLAD WOOD (OR EQUAL) EXTERIOR DOOR | ALL SIDES OF DOOR FACTORY PRIMED AND PAINTED. BACK PRIME AND (2) COAT FINISH PAINT FRAME | N/A | 2/A20 & 1/A20 | ALL GLASS SHALL BE INSULATED TEMPERED (SAFETY) GLASS WITH SIMULATED DIVIDED LITE/GRILL BETWEEN GLASS (SDL/GBG). | NONE | D131 | TYPE 6 | +/-3' 0" x +/-6' 8" | NEW WOOD | TWO-PANEL WOOD DOOR (SPANISH CEDAR OR EQUAL) - PROVIDE STOCK DOOR WITH SIMILAR PROFILE TO OTHER INTERIOR DOORS | SURFACE PREPARE, PRIME, AND (2) COAT FINISH PAINT ALL 6 SIDES OF DOOR | N/A | 4/A20 & 1/A20 | ALL GLASS SHALL BE INSULATED TEMPERED (SAFETY) GLASS WITH SIMULATED DIVIDED LITE/GRILL BETWEEN GLASS (SDL/GBG). | KITCHEN |
| D108 | TYPE 5 | +/-3' 0" x +/-9' 0" | NEW WOOD | 24-LITE FIBERGLASS-CLAD WOOD (OR EQUAL) EXTERIOR DOOR | ALL SIDES OF DOOR FACTORY PRIMED AND PAINTED. BACK PRIME AND (2) COAT FINISH PAINT FRAME | N/A | 2/A20 & 1/A20 | ALL GLASS SHALL BE INSULATED TEMPERED (SAFETY) GLASS WITH SIMULATED DIVIDED LITE/GRILL BETWEEN GLASS (SDL/GBG). | NONE | D132 | TYPE 6 | +/-2' 8" x +/-6' 8" | NEW WOOD | TWO-PANEL WOOD DOOR (SPANISH CEDAR OR EQUAL) - PROVIDE STOCK DOOR WITH SIMILAR PROFILE TO OTHER INTERIOR DOORS | SURFACE PREPARE, PRIME, AND (2) COAT FINISH PAINT ALL 6 SIDES OF DOOR | N/A | 4/A20 & 1/A20 | ALL GLASS SHALL BE INSULATED TEMPERED (SAFETY) GLASS WITH SIMULATED DIVIDED LITE/GRILL BETWEEN GLASS (SDL/GBG). | CLOSET |
| D109 | TYPE 5 | +/-3' 0" x +/-9' 0" | NEW WOOD | 24-LITE FIBERGLASS-CLAD WOOD (OR EQUAL) EXTERIOR DOOR | ALL SIDES OF DOOR FACTORY PRIMED AND PAINTED. BACK PRIME AND (2) COAT FINISH PAINT FRAME | N/A | 2/A20 & 1/A20 | ALL GLASS SHALL BE INSULATED TEMPERED (SAFETY) GLASS WITH SIMULATED DIVIDED LITE/GRILL BETWEEN GLASS (SDL/GBG). | NONE | D133 | TYPE 6 | +/-3' 0" x +/-6' 8" | NEW WOOD | TWO-PANEL WOOD DOOR (SPANISH CEDAR OR EQUAL) - PROVIDE STOCK DOOR WITH SIMILAR PROFILE TO OTHER INTERIOR DOORS | SURFACE PREPARE, PRIME, AND (2) COAT FINISH PAINT ALL 6 SIDES OF DOOR | N/A | 4/A20 & 1/A20 | ALL GLASS SHALL BE INSULATED TEMPERED (SAFETY) GLASS WITH SIMULATED DIVIDED LITE/GRILL BETWEEN GLASS (SDL/GBG). | UTILITY ROOM |
| D115 | TYPE 1 | +/-3' 0" x +/-7' 0" | NEW WOOD | 18-LITE FIBERGLASS-CLAD WOOD (OR EQUAL) EXTERIOR DOOR | ALL SIDES OF DOOR FACTORY PRIMED AND PAINTED. BACK PRIME AND (2) COAT FINISH PAINT FRAME | N/A | 9/A13 & 1/A12 | ALL GLASS SHALL BE INSULATED TEMPERED (SAFETY) GLASS WITH SIMULATED DIVIDED LITE/GRILL BETWEEN GLASS (SDL/GBG). | NONE | DOOR NOTES: 1. REFER TO HARDWARE SCHEDULE AND TECHNICAL SPECIFICATIONS FOR ADDITIONAL DETAIL ON HARDWARE REQUIREMENTS INCLUDING ACCEPTABLE MANUFACTURERS, REQUIRED ACCESSORIES, ETC. 2. ALL DOORS WHERE FEASIBLE ARE TO BE FITTED WITH STOPS/BUMPERS EXCEPT WHERE CLOSERS SERVE THAT PURPOSE. THE FOLLOWING IS ORDER OF PREFERENCE DEPENDING ON DOOR CONFIGURATION: AT FLOOR, AT WALL, AND AT HINGE. REFER TO TECHNICAL SPECIFICATIONS FOR ADDITIONAL INFORMATION ON DOOR BUMPERS. 4. ALL NEW EXTERIOR DOOR HARDWARE SHALL BE STAINLESS STEEL. 5. IF THE DOOR SCHEDULE DOES NOT SAY "NEW" BUT THE DOOR IS NEW THEN ALL HARDWARE IS ALSO "NEW". | | | | | | | | | |

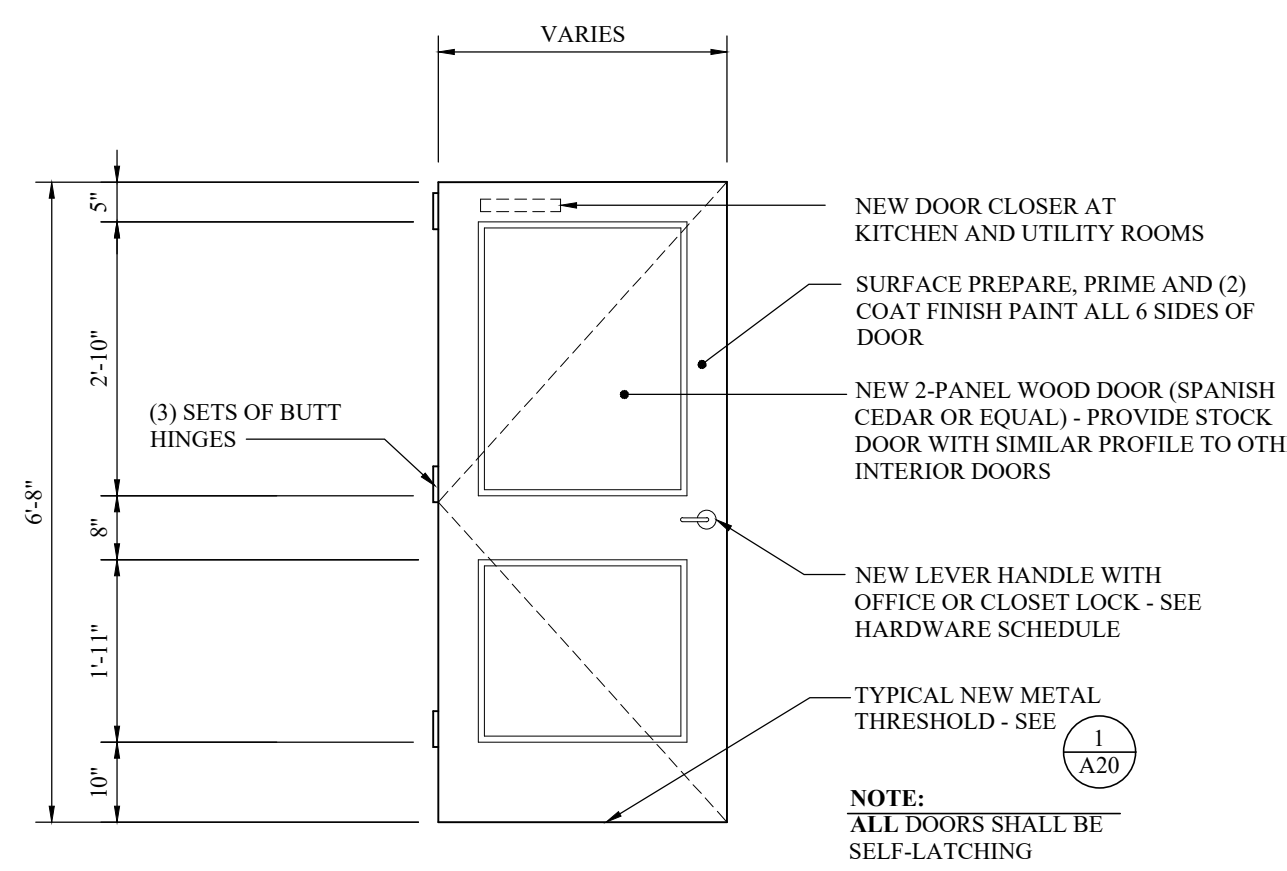


TYPE 4 (2) 3'-0" x 7'-0"
EXTERIOR - NEW
D103

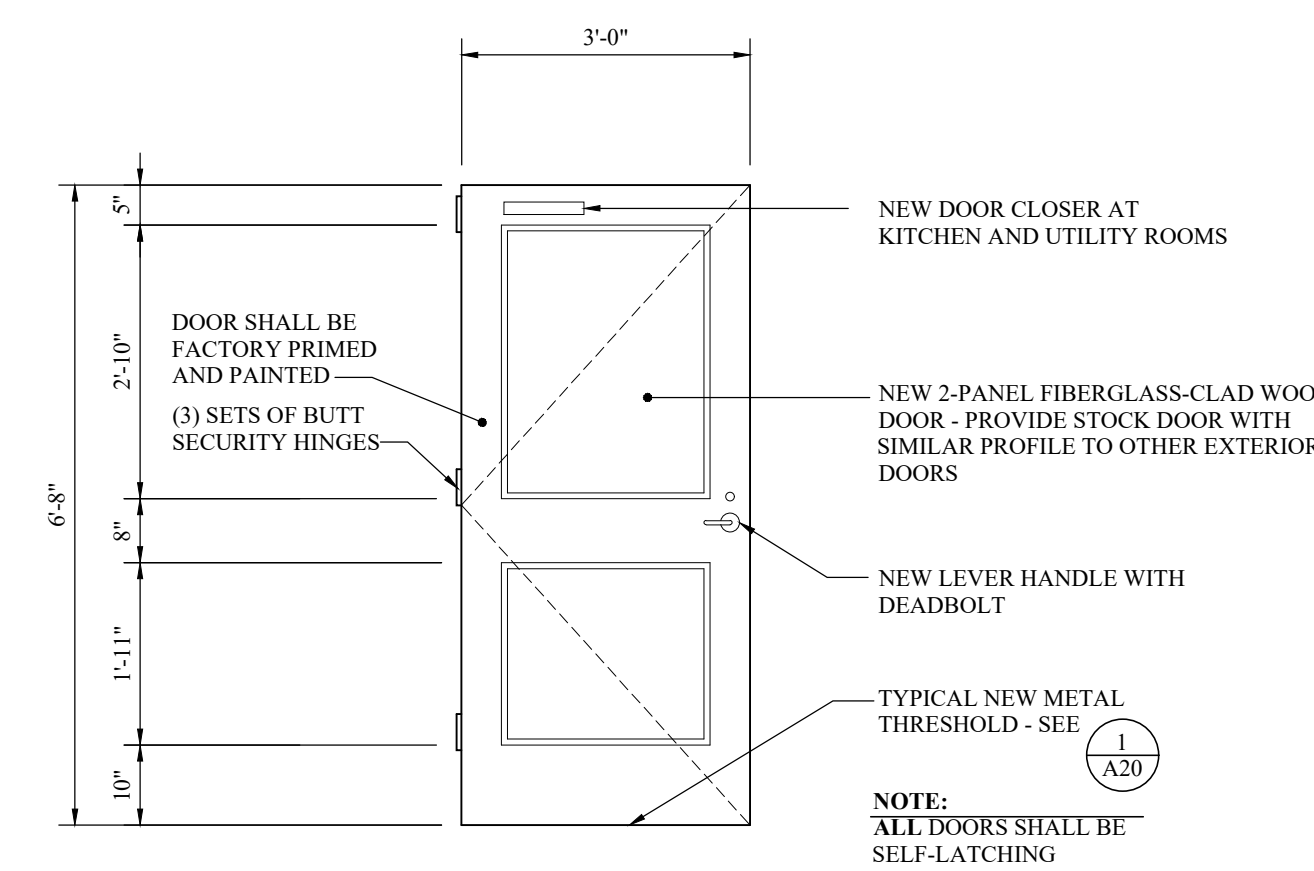


NOTE: (TYPICAL FOR EXTERIOR DOORS): PROVIDE WEATHERSTRIPPING AT JAMBS, HEAD AND SILL (DOOR MANUFACTURER-SUPPLIED WEATHERSTRIPPING SHALL BE ACCEPTABLE) BRASS FITTING/CONCEALED, WEATHERSTRIPPING COLOR SHALL BE CHOSEN BY ARCHITECT

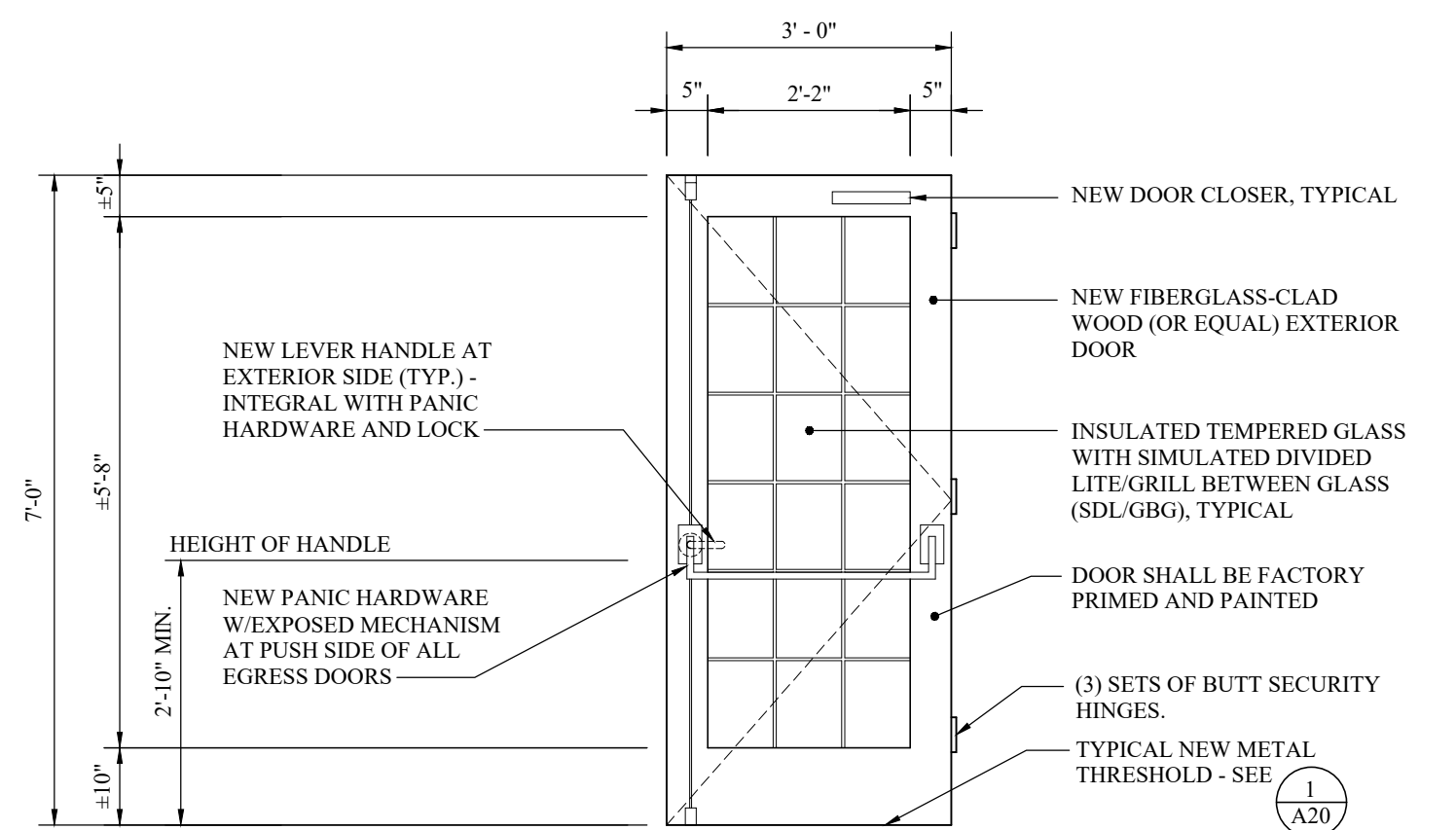
TYPE 5 3'-0" x 9'-0"
EXTERIOR - NEW
D107 D108 D109



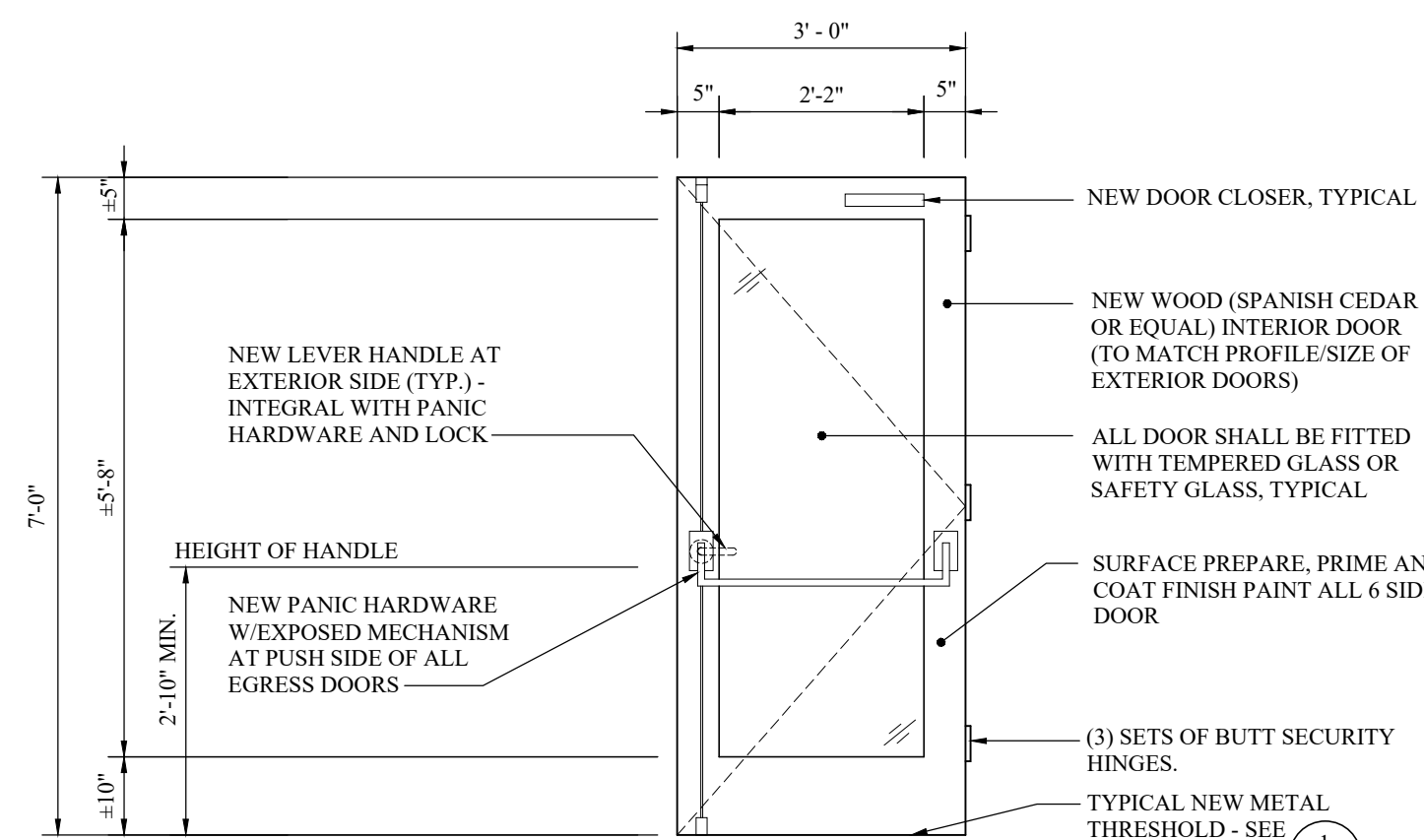
TYPE 6 3'-0" x 6'-8"
INTERIOR - NEW
D129 D130 D131 D132 D133



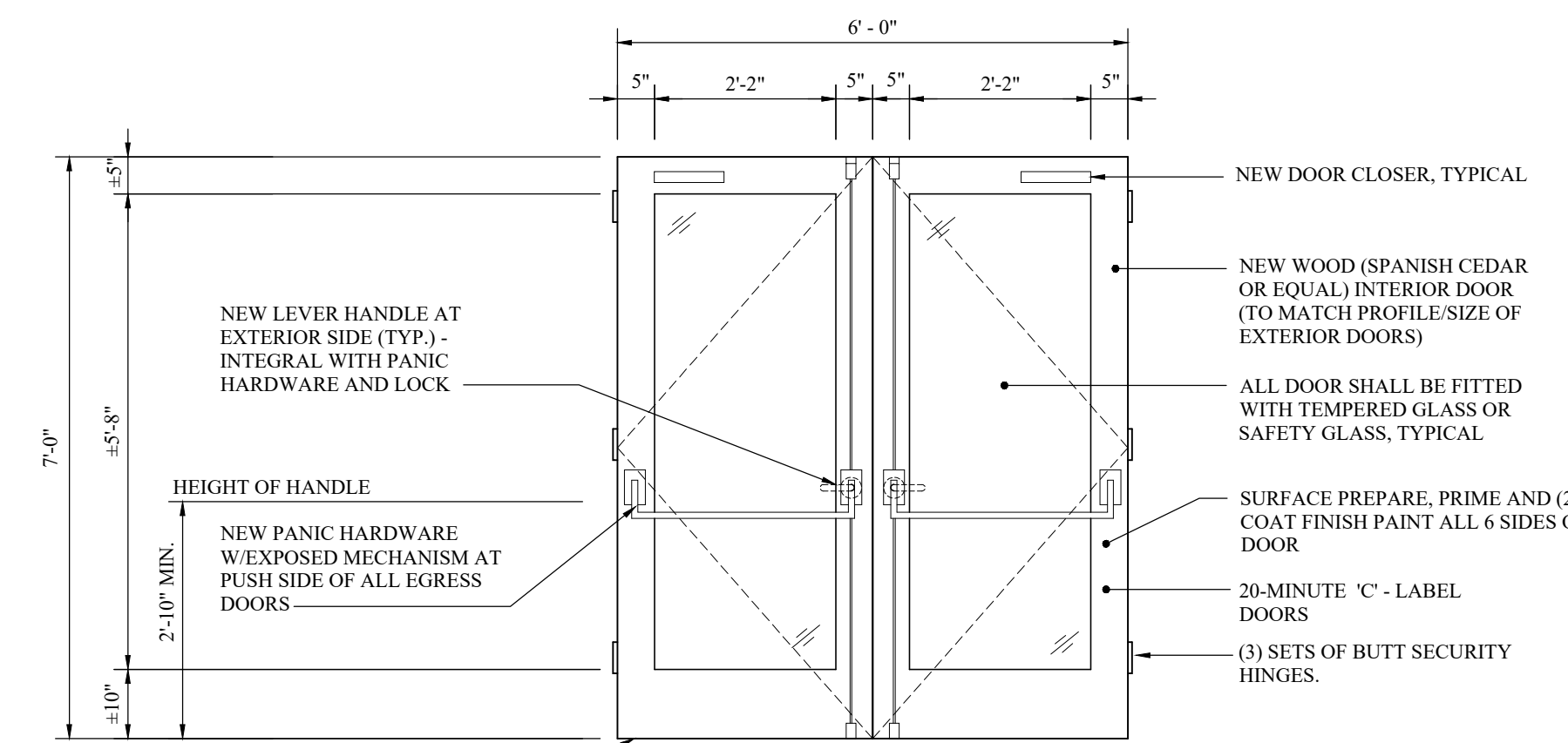
TYPE 7 3'-0" x 6'-8"
EXTERIOR - NEW
D104 D105



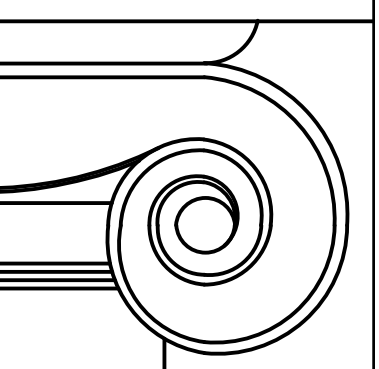
TYPE 1 3'-0" x 7'-0"
EXTERIOR - NEW
D101 D115



TYPE 2 3'-0" x 7'-0"
INTERIOR - NEW
D122



TYPE 3 (2) 3'-0" x 7'-0"
INTERIOR - NEW 'C' LABEL - 20 MINUTE
D126



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PROJECT No.: 1836C
DATE: 30 JUNE 2021
REVISIONS:

DRAWN BY: TBC, MMH, MS

RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
 TOWNSHIP OF PISCATAWAY
 MIDDLESEX COUNTY, NEW JERSEY

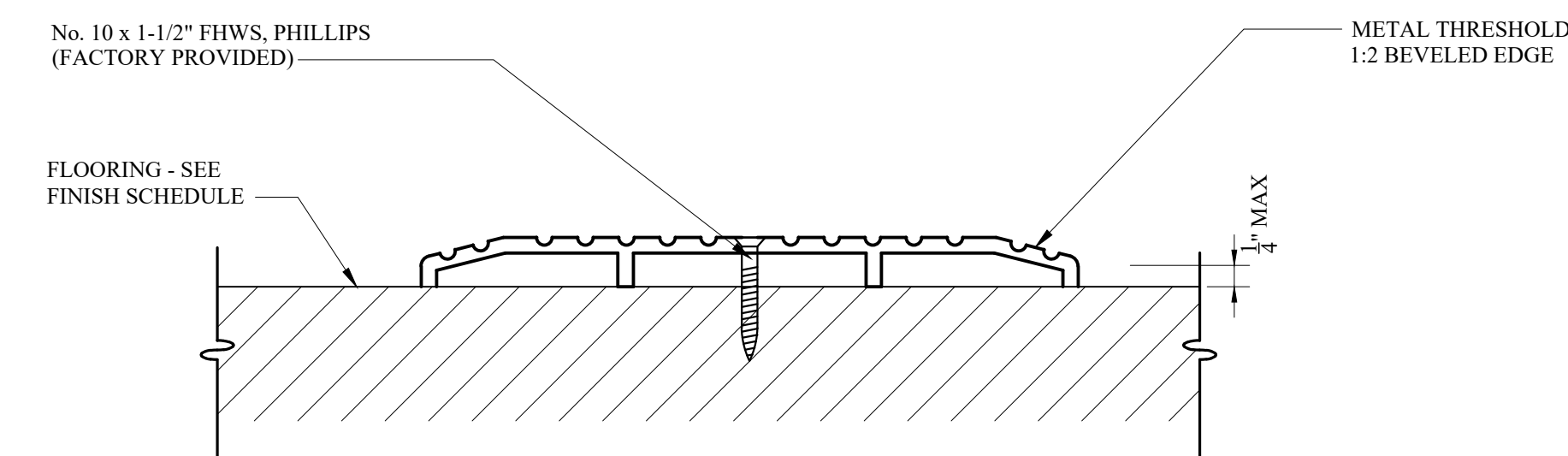
DOOR HARDWARE SCHEDULE

| DOOR NO(S) | ITEM TYPE | QUANTITY | ITEM DESCRIPTION | FINISH | DOOR NO(S) | ITEM TYPE | QUANTITY | ITEM DESCRIPTION | FINISH |
|--------------|------------------|--|--|------------------------------------|------------|------------------|--|---|------------------------------------|
| D101 D115 | HINGE | 3 | BUTT SECURITY HINGE SET | ANTIQUE BRONZE TO MATCH MAIN HOUSE | D122 | HINGE | 3 | BUTT SECURITY HINGE SET | ANTIQUE BRONZE TO MATCH MAIN HOUSE |
| | FLUSH BOLT | — | N/A | | | FLUSHBOLT | — | N/A | |
| | LATCH | 1 | SHALL BE SELF-LATCHING | | | LATCH | 1 | SHALL BE SELF-LATCHING | |
| | LOCKSET | 1 | LOCKING LEVER HANDLE AT EXTERIOR SIDE (TYP.) - INTEGRAL WITH PANIC HARDWARE | BRASS | | LOCKSET | 1 | LOCKING LEVER HANDLE AT EXTERIOR SIDE (TYP.) - INTEGRAL WITH PANIC HARDWARE AT INTERIOR | BRASS |
| | EXIT DEVICE | 1 | EXPOSED, BAR-TYPE PANIC HARDWARE W/ EXPOSED MECHANISM AT PUSH SIDE OF ALL EGRESS DOORS | BRASS | | EXIT DEVICE | 1 | EXPOSED, BAR-TYPE PANIC HARDWARE W/ EXPOSED MECHANISM AT PUSH SIDE OF ALL EGRESS DOORS | BRASS |
| | EXIT DEVICE TRIM | — | BLANK ESCUTCHEON LEVER | TO MATCH PANIC HARDWARE | | EXIT DEVICE TRIM | — | DUMMY TRIM LEVER | BRASS |
| | COORDINATOR | — | N/A | | | COORDINATOR | — | N/A | |
| | CLOSER | 1 | PROVIDE ONE FOR EACH LEAF | | | CLOSER | 1 | PROVIDE ONE FOR EACH LEAF | |
| | THRESHOLD | 1 | NEW METAL, ADA COMPLIANT | BRASS | | THRESHOLD | 1 | NEW METAL, ADA COMPLIANT | BRASS |
| | DOOR STOP | 0 | NONE | | | DOOR STOP | — | CLOSER TO LIMIT DOOR FROM OVEREXTENDING | BRASS |
| OTHER/MISC. | — | PROVIDE WEATHERSTRIPPING AT JAMBS, HEAD AND SILL (DOOR MANUFACTURER SUPPLIED WEATHERSTRIPPING SHALL BE ACCEPTABLE) | CONCEALED BRASS WEATHERSTRIPPING, COLOR SHALL BE CHOSEN BY ARCHITECT | OTHER/MISC. | — | N/A | CONCEALED BRASS WEATHERSTRIPPING, COLOR SHALL BE CHOSEN BY ARCHITECT | | |

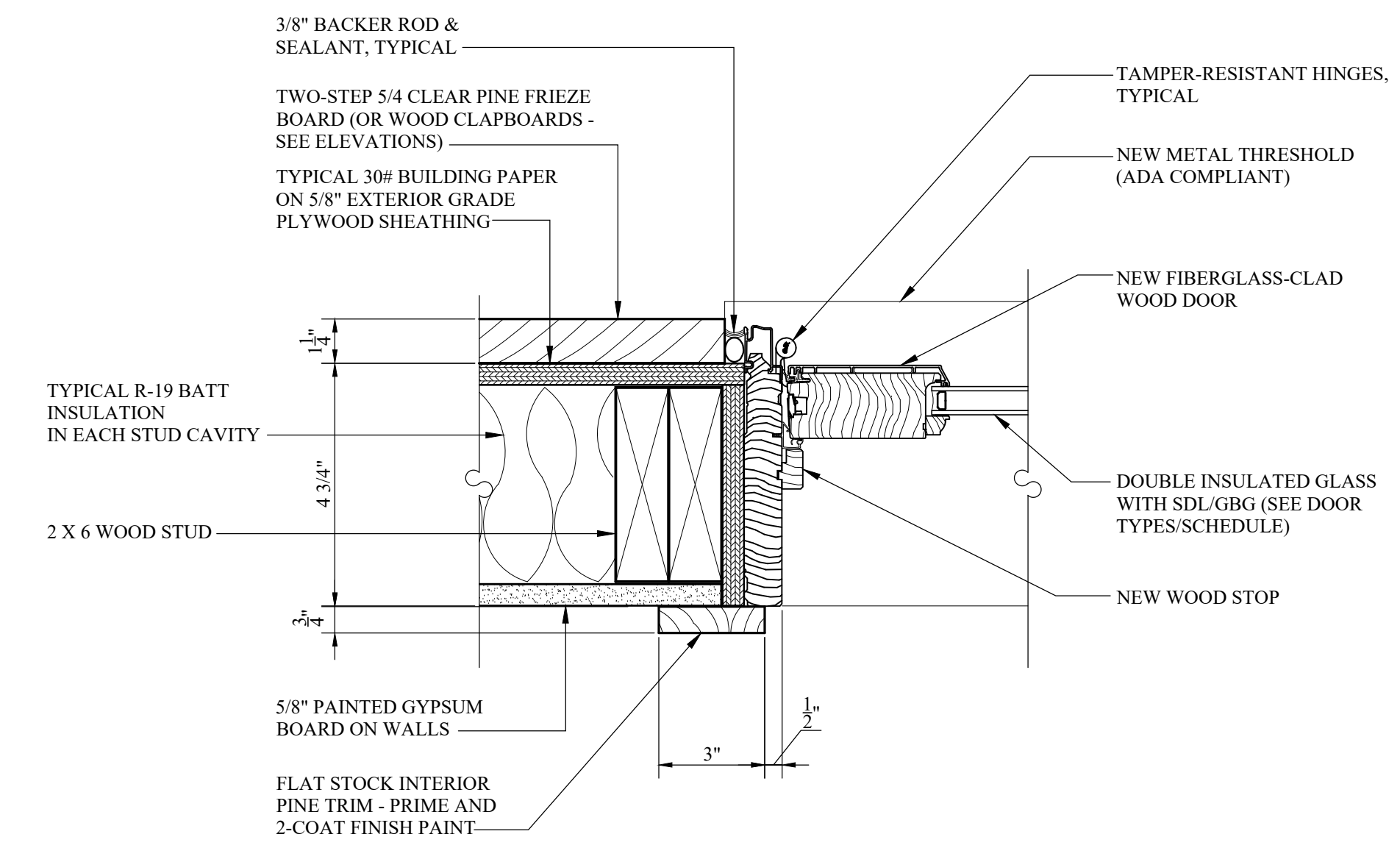
| DOOR NO(S) | ITEM TYPE | QUANTITY | ITEM DESCRIPTION | FINISH | DOOR NO(S) | ITEM TYPE | QUANTITY | ITEM DESCRIPTION | FINISH |
|-------------|------------------|------------|---|------------------------------------|------------|--|--|--|------------------------------------|
| D126 | HINGE | 3 PER LEAF | BUTT SECURITY HINGE SET | ANTIQUE BRONZE TO MATCH MAIN HOUSE | D103 | HINGE | 3 PER LEAF | BUTT SECURITY HINGE SET | ANTIQUE BRONZE TO MATCH MAIN HOUSE |
| | FLUSH BOLT | — | N/A | | | FLUSHBOLT | 1 | INSTALL FLUSHBOLT AT (1) LEAF | |
| | LATCH | 1 | SHALL BE SELF-LATCHING | | | LATCH | 1 | SHALL BE SELF-LATCHING | |
| | LOCKSET | 1 PER LEAF | LOCKING LEVER HANDLE AT EXTERIOR SIDE (TYP.) - INTEGRAL WITH PANIC HARDWARE AT INTERIOR | BRASS | | LOCKSET | 1 | LEVER HANDLE WITH SEPARATE DEADBOLT | BRASS |
| | EXIT DEVICE | 1 PER LEAF | EXPOSED, BAR-TYPE PANIC HARDWARE W/ EXPOSED MECHANISM AT PUSH SIDE OF ALL EGRESS DOORS | BRASS | | EXIT DEVICE | — | N/A | BRASS |
| | EXIT DEVICE TRIM | — | DUMMY TRIM LEVER | BRASS | | EXIT DEVICE TRIM | 1 | STANDARD LEVER | |
| | COORDINATOR | 1 | AS PART OF PANIC EXIT DEVICE | | | COORDINATOR | — | PROVIDE ASTRAGAL TO COORDINATE DOUBLE DOOR OPERATION | |
| | CLOSER | 2 | PROVIDE ONE FOR EACH LEAF | | | CLOSER | 2 | PROVIDE ONE FOR EACH LEAF | |
| | THRESHOLD | 1 | NEW METAL, ADA COMPLIANT | BRASS | | THRESHOLD | 1 | NEW METAL, ADA COMPLIANT | BRASS |
| | DOOR STOP | — | CLOSER TO LIMIT DOOR FROM OVEREXTENDING | BRASS | | DOOR STOP | 2 | AT WALL/BASEBOARD | BRASS |
| OTHER/MISC. | — | N/A | | OTHER/MISC. | — | PROVIDE WEATHERSTRIPPING AT JAMBS, HEAD AND SILL (DOOR MANUFACTURER SUPPLIED WEATHERSTRIPPING SHALL BE ACCEPTABLE) | CONCEALED BRASS WEATHERSTRIPPING, COLOR SHALL BE CHOSEN BY ARCHITECT | | |

| DOOR NO(S) | ITEM TYPE | QUANTITY | ITEM DESCRIPTION | FINISH | DOOR NO(S) | ITEM TYPE | QUANTITY | ITEM DESCRIPTION | FINISH |
|----------------------|------------------|--|---|------------------------------------|--------------------------------------|------------------|----------|--|------------------------------------|
| D107 D108 D109 | HINGE | 4 | BUTT SECURITY HINGE SET | ANTIQUE BRONZE TO MATCH MAIN HOUSE | D129 D130 D131 D132 D133 | HINGE | 3 | BUTT HINGE SET | ANTIQUE BRONZE TO MATCH MAIN HOUSE |
| | FLUSH BOLT | — | N/A | | | FLUSHBOLT | — | N/A | |
| | LATCH | 1 | SHALL BE SELF-LATCHING | | | LATCH | 1 | SHALL BE SELF-LATCHING | |
| | LOCKSET | 1 | LOCKING LEVER HANDLE AT EXTERIOR SIDE (TYP.) - INTEGRAL WITH PANIC HARDWARE AT INTERIOR | BRASS | | LOCKSET | 1 | LOCKING LEVER HANDLE WITH OFFICE OR CLOSET LOCK | BRASS |
| | EXIT DEVICE | 1 | EXPOSED, BAR-TYPE PANIC HARDWARE W/ EXPOSED MECHANISM AT PUSH SIDE OF ALL EGRESS DOORS | BRASS | | EXIT DEVICE | — | N/A | |
| | EXIT DEVICE TRIM | — | BLANK ESCUTCHEON LEVER | TO MATCH PANIC HARDWARE | | EXIT DEVICE TRIM | — | N/A | |
| | COORDINATOR | — | N/A | | | COORDINATOR | — | N/A | |
| | CLOSER | 1 | PROVIDE ONE FOR EACH LEAF | | | CLOSER | 1 | PROVIDE ONLY AT KITCHEN AND UTILITY ROOMS, ONE FOR EACH LEAF | BRASS |
| | THRESHOLD | 1 | NEW METAL, ADA COMPLIANT | BRASS | | THRESHOLD | 1 | NEW METAL, ADA COMPLIANT | BRASS |
| | DOOR STOP | — | CLOSERS SHALL CONTROL LIMITS ON DOOR OPENING | BRASS | | DOOR STOP | 1 | AT WALL - AT WOOD BASE | BRASS |
| OTHER/MISC. | — | PROVIDE WEATHERSTRIPPING AT JAMBS, HEAD AND SILL (DOOR MANUFACTURER SUPPLIED WEATHERSTRIPPING SHALL BE ACCEPTABLE) | CONCEALED BRASS WEATHERSTRIPPING, COLOR SHALL BE CHOSEN BY ARCHITECT | OTHER/MISC. | — | N/A | | | |

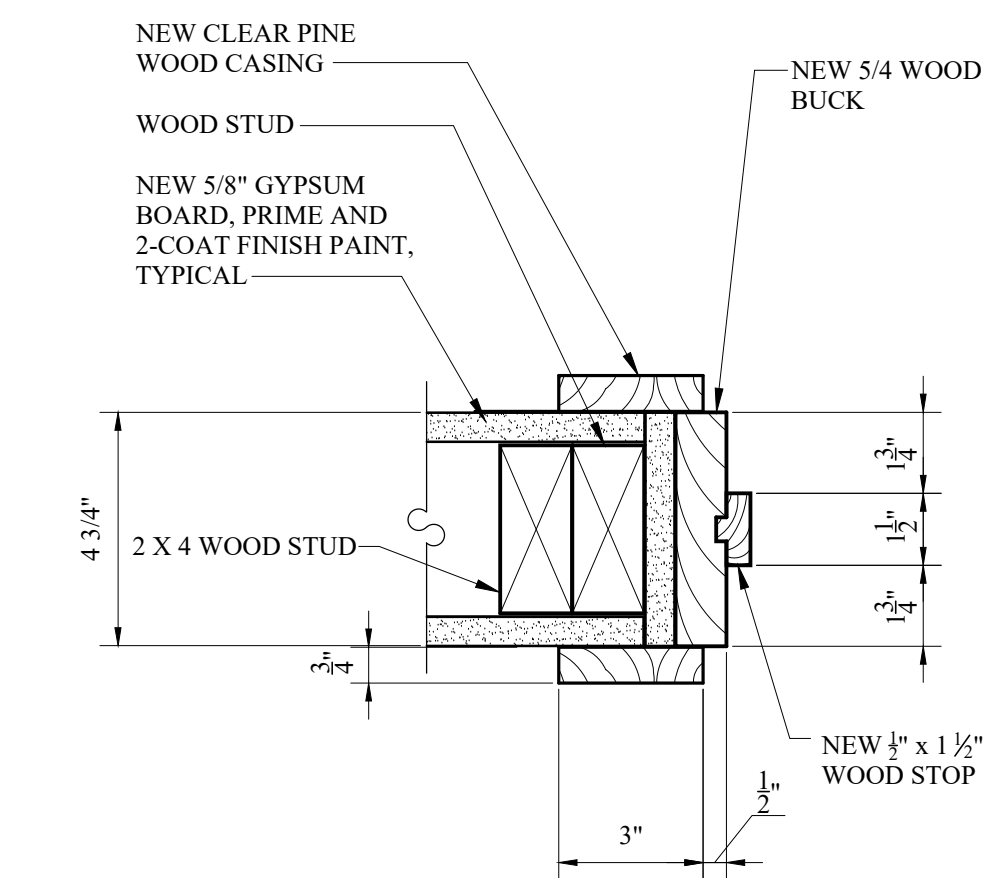
| DOOR NO(S) | ITEM TYPE | QUANTITY | ITEM DESCRIPTION | FINISH |
|--------------|------------------|--|--|------------------------------------|
| D104 D105 | HINGE | 3 | BUTT SECURITY HINGE SET | ANTIQUE BRONZE TO MATCH MAIN HOUSE |
| | FLUSH BOLT | — | N/A | |
| | LATCH | 1 | DEADBOLT SEPARATE FROM LEVER HANDLE; SHALL BE SELF-LATCHING | BRASS |
| | LOCKSET | 1 | LEVER HANDLE WITH SEPARATE DEADBOLT | BRASS |
| | EXIT DEVICE | — | N/A | BRASS |
| | EXIT DEVICE TRIM | — | N/A | BRASS |
| | COORDINATOR | — | N/A | |
| | CLOSER | 1 | PROVIDE ONLY AT KITCHEN AND UTILITY ROOMS, ONE FOR EACH LEAF | BRASS |
| | THRESHOLD | 1 | NEW METAL, ADA COMPLIANT | BRASS |
| | DOOR STOP | 0 | NONE | BRASS |
| OTHER/MISC. | — | PROVIDE WEATHERSTRIPPING AT JAMBS, HEAD AND SILL (DOOR MANUFACTURER SUPPLIED WEATHERSTRIPPING SHALL BE ACCEPTABLE) | CONCEALED BRASS WEATHERSTRIPPING, COLOR SHALL BE CHOSEN BY ARCHITECT | |



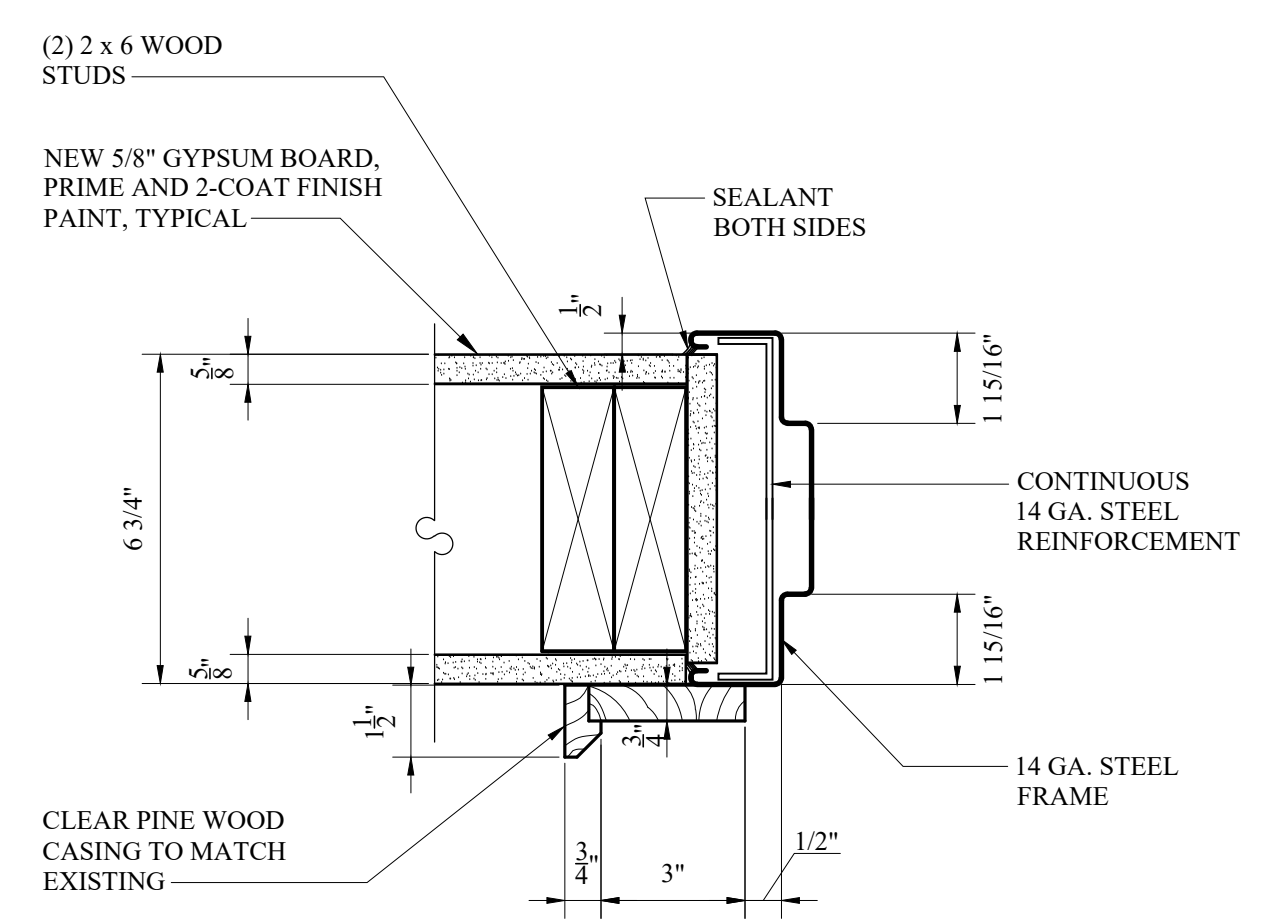
1
A20 METAL THRESHOLD
1/4" = 1' - 0"



2
A20 EXTERIOR DOOR BUCK @ GALLERY
3" = 1' - 0"

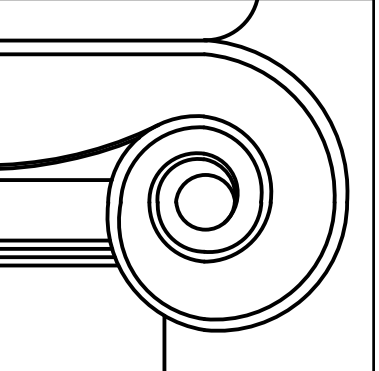


4
A20 INTERIOR DOOR BUCK @ GALLERY
3" = 1' - 0"



NOTE:
INTERIOR TRIM PROFILE AT DOORS (AND WINDOWS) SHALL MATCH TYPICAL EXISTING AT CORRIDOR OF MAIN HOUSE

3
A20 INTERIOR DOOR BUCK @ CORRIDOR
3" = 1' - 0"



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PROJECT No.: 1836C
DATE: 30 JUNE 2021

REVISIONS:

DRAWN BY: TBC, MMH, MS

RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
 TOWNSHIP OF PISCATAWAY
 MIDDLESEX COUNTY, NEW JERSEY

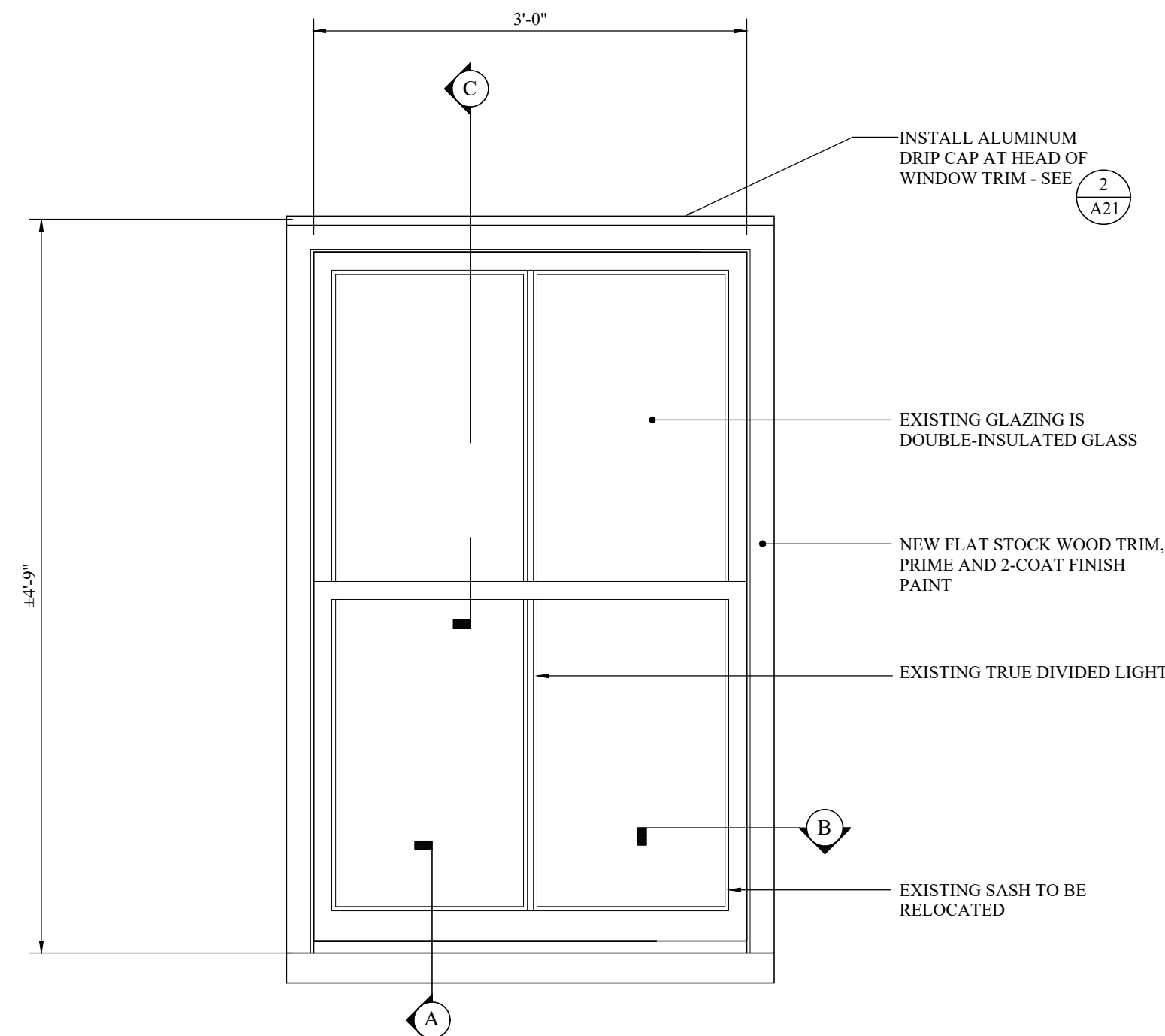
A20

WINDOW SCHEDULE

| WINDOW NO | TYPE | SIZE | DESCRIPTION | FRAME | SASH | GLAZING | HARDWARE | INTERIOR STORM / EXTERIOR SHUTTERS | REMARKS |
|-----------|--------|-----------------------|--|-----------|---|--|-----------------------------|------------------------------------|--|
| W102 | TYPE 1 | +/- 3'-0" x +/- 7'-0" | 18-LITE FIXED FIBERGLASS-CLAD WOOD (OR EQUAL) EXTERIOR WINDOW | NEW WOOD | ALL SIDES OF WINDOW FACTORY PRIMED AND PAINTED. BACK PRIME AND (2) COAT FINISH PAINT FRAME | INSULATED TEMPERED GLASS WITH SIMULATED DIVIDED LITE-GRILL BETWEEN GLASS (SDL/GBG) | NEW METAL SILL | NONE | |
| W106 | TYPE 4 | +/- 3'-0" x +/- 4'-9" | TWO-LITE OVER TWO-LITE DOUBLE EXTERIOR WINDOW | NEW WOOD | SURFACE PREPARE, PRIME, AND (2) COAT FINISH PAINT | EXISTING DOUBLE-INSULATED | RELOCATE EXISTING SASH LOCK | NONE | RELOCATE EXISTING WINDOW FROM VESTIBULE TO LOCATION SHOWN ON PLANS |
| W110 | TYPE 1 | +/- 3'-0" x +/- 7'-0" | 18-LITE FIXED FIBERGLASS-CLAD WOOD (OR EQUAL) EXTERIOR WINDOW | NEW WOOD | ALL SIDES OF WINDOW FACTORY PRIMED AND PAINTED. BACK PRIME AND (2) COAT FINISH PAINT FRAME | INSULATED TEMPERED GLASS WITH SIMULATED DIVIDED LITE-GRILL BETWEEN GLASS (SDL/GBG) | NEW METAL SILL | NONE | |
| W111 | TYPE 1 | +/- 3'-0" x +/- 7'-0" | 18-LITE FIXED FIBERGLASS-CLAD WOOD (OR EQUAL) EXTERIOR WINDOW | NEW WOOD | ALL SIDES OF WINDOW FACTORY PRIMED AND PAINTED. BACK PRIME AND (2) COAT FINISH PAINT FRAME | INSULATED TEMPERED GLASS WITH SIMULATED DIVIDED LITE-GRILL BETWEEN GLASS (SDL/GBG) | NEW METAL SILL | NONE | |
| W112 | TYPE 1 | +/- 3'-0" x +/- 7'-0" | 18-LITE FIXED FIBERGLASS-CLAD WOOD (OR EQUAL) EXTERIOR WINDOW | NEW WOOD | ALL SIDES OF WINDOW FACTORY PRIMED AND PAINTED. BACK PRIME AND (2) COAT FINISH PAINT FRAME | INSULATED TEMPERED GLASS WITH SIMULATED DIVIDED LITE-GRILL BETWEEN GLASS (SDL/GBG) | NEW METAL SILL | NONE | |
| W113 | TYPE 1 | +/- 3'-0" x +/- 7'-0" | 18-LITE FIXED FIBERGLASS-CLAD WOOD (OR EQUAL) EXTERIOR WINDOW | NEW WOOD | ALL SIDES OF WINDOW FACTORY PRIMED AND PAINTED. BACK PRIME AND (2) COAT FINISH PAINT FRAME | INSULATED TEMPERED GLASS WITH SIMULATED DIVIDED LITE-GRILL BETWEEN GLASS (SDL/GBG) | NEW METAL SILL | NONE | |
| W114 | TYPE 1 | +/- 3'-0" x +/- 7'-0" | 18-LITE FIXED FIBERGLASS-CLAD WOOD (OR EQUAL) EXTERIOR WINDOW | NEW WOOD | ALL SIDES OF WINDOW FACTORY PRIMED AND PAINTED. BACK PRIME AND (2) COAT FINISH PAINT FRAME | INSULATED TEMPERED GLASS WITH SIMULATED DIVIDED LITE-GRILL BETWEEN GLASS (SDL/GBG) | NEW METAL SILL | NONE | |
| W116 | TYPE 1 | +/- 3'-0" x +/- 7'-0" | 18-LITE FIXED FIBERGLASS-CLAD WOOD (OR EQUAL) EXTERIOR WINDOW | NEW WOOD | ALL SIDES OF WINDOW FACTORY PRIMED AND PAINTED. BACK PRIME AND (2) COAT FINISH PAINT FRAME | INSULATED TEMPERED GLASS WITH SIMULATED DIVIDED LITE-GRILL BETWEEN GLASS (SDL/GBG) | NEW METAL SILL | NONE | |
| W117 | TYPE 1 | +/- 3'-0" x +/- 7'-0" | 18-LITE FIXED FIBERGLASS-CLAD WOOD (OR EQUAL) EXTERIOR WINDOW | NEW WOOD | ALL SIDES OF WINDOW FACTORY PRIMED AND PAINTED. BACK PRIME AND (2) COAT FINISH PAINT FRAME | INSULATED TEMPERED GLASS WITH SIMULATED DIVIDED LITE-GRILL BETWEEN GLASS (SDL/GBG) | NEW METAL SILL | NONE | |
| W118 | TYPE 1 | +/- 3'-0" x +/- 7'-0" | 18-LITE FIXED FIBERGLASS-CLAD WOOD (OR EQUAL) EXTERIOR WINDOW | NEW WOOD | ALL SIDES OF WINDOW FACTORY PRIMED AND PAINTED. BACK PRIME AND (2) COAT FINISH PAINT FRAME | INSULATED TEMPERED GLASS WITH SIMULATED DIVIDED LITE-GRILL BETWEEN GLASS (SDL/GBG) | NEW METAL SILL | NONE | |
| W119 | TYPE 1 | +/- 3'-0" x +/- 7'-0" | 18-LITE FIXED FIBERGLASS-CLAD WOOD (OR EQUAL) EXTERIOR WINDOW | NEW WOOD | ALL SIDES OF WINDOW FACTORY PRIMED AND PAINTED. BACK PRIME AND (2) COAT FINISH PAINT FRAME | INSULATED TEMPERED GLASS WITH SIMULATED DIVIDED LITE-GRILL BETWEEN GLASS (SDL/GBG) | NEW METAL SILL | NONE | |
| W120 | TYPE 1 | +/- 3'-0" x +/- 7'-0" | 18-LITE FIXED FIBERGLASS-CLAD WOOD (OR EQUAL) EXTERIOR WINDOW | NEW WOOD | ALL SIDES OF WINDOW FACTORY PRIMED AND PAINTED. BACK PRIME AND (2) COAT FINISH PAINT FRAME | INSULATED TEMPERED GLASS WITH SIMULATED DIVIDED LITE-GRILL BETWEEN GLASS (SDL/GBG) | NEW METAL SILL | NONE | |
| W121 | TYPE 2 | +/- 3'-0" x +/- 7'-0" | ONE-LITE FIXED WOOD (SPANISH CEDAR OR EQUAL) INTERIOR WINDOW (TO MATCH PROFILE/SIZE OF EXTERIOR WINDOWS) | NEW WOOD | SURFACE PREPARE, PRIME, AND (2) COAT FINISH PAINT ALL 6 SIDES OF WINDOW. BACK PRIME AND (2) COAT FINISH PAINT FRAME | ALL GLASS SHALL BE TEMPERED (SAFETY) GLASS | NEW METAL SILL | NONE | |
| W123 | TYPE 2 | +/- 3'-0" x +/- 7'-0" | ONE-LITE FIXED WOOD (SPANISH CEDAR OR EQUAL) INTERIOR WINDOW (TO MATCH PROFILE/SIZE OF EXTERIOR WINDOWS) | NEW WOOD | SURFACE PREPARE, PRIME, AND (2) COAT FINISH PAINT ALL 6 SIDES OF WINDOW. BACK PRIME AND (2) COAT FINISH PAINT FRAME | ALL GLASS SHALL BE TEMPERED (SAFETY) GLASS | NEW METAL SILL | NONE | |
| W124 | TYPE 3 | +/- 2'-3" x +/- 7'-0" | ONE-LITE FIXED WOOD (SPANISH CEDAR OR EQUAL) INTERIOR WINDOW (TO MATCH PROFILE/SIZE OF EXTERIOR WINDOWS) | NEW METAL | SURFACE PREPARE, PRIME, AND (2) COAT FINISH PAINT ALL 6 SIDES OF WINDOW. BACK PRIME AND (2) COAT FINISH PAINT FRAME | ALL GLASS SHALL BE TEMPERED (SAFETY) GLASS | NEW METAL SILL | NONE | C' LABEL 20-MINUTE |
| W125 | TYPE 3 | +/- 2'-3" x +/- 7'-0" | ONE-LITE FIXED WOOD (SPANISH CEDAR OR EQUAL) INTERIOR WINDOW (TO MATCH PROFILE/SIZE OF EXTERIOR WINDOWS) | NEW METAL | SURFACE PREPARE, PRIME, AND (2) COAT FINISH PAINT ALL 6 SIDES OF WINDOW. BACK PRIME AND (2) COAT FINISH PAINT FRAME | ALL GLASS SHALL BE TEMPERED (SAFETY) GLASS | NEW METAL SILL | NONE | C' LABEL 20-MINUTE |
| W127 | TYPE 3 | +/- 2'-3" x +/- 7'-0" | ONE-LITE FIXED WOOD (SPANISH CEDAR OR EQUAL) INTERIOR WINDOW (TO MATCH PROFILE/SIZE OF EXTERIOR WINDOWS) | NEW METAL | SURFACE PREPARE, PRIME, AND (2) COAT FINISH PAINT ALL 6 SIDES OF WINDOW. BACK PRIME AND (2) COAT FINISH PAINT FRAME | ALL GLASS SHALL BE TEMPERED (SAFETY) GLASS | NEW METAL SILL | NONE | C' LABEL 20-MINUTE |
| W128 | TYPE 3 | +/- 2'-3" x +/- 7'-0" | ONE-LITE FIXED WOOD (SPANISH CEDAR OR EQUAL) INTERIOR WINDOW (TO MATCH PROFILE/SIZE OF EXTERIOR WINDOWS) | NEW METAL | SURFACE PREPARE, PRIME, AND (2) COAT FINISH PAINT ALL 6 SIDES OF WINDOW. BACK PRIME AND (2) COAT FINISH PAINT FRAME | ALL GLASS SHALL BE TEMPERED (SAFETY) GLASS | NEW METAL SILL | NONE | C' LABEL 20-MINUTE |

WINDOW NOTES:

- SCOPE INCLUDES INSTALLATION OF NEW SASHES AND FRAMES AND RELOCATION OF EXISTING WINDOWS WHERE NOTED. ALL PROFILES SHALL MATCH AND THE WOOD SPECIES SHALL MATCH THAT OF NEW DOORS TO PROVIDE A COHESIVE INTERIOR APPEARANCE BETWEEN WINDOWS AND DOORS.
- CONTRACTOR IS RESPONSIBLE FOR FIELD VERIFYING ALL EXISTING CONDITIONS PRIOR TO GENERATION OF SHOP DRAWINGS.
- ALL WINDOWS SHALL BE FIELD PRIMED AND PAINTED WITH (2) COATS FINISH PAINT (INTERIOR AND EXTERIOR) EXCEPT WHERE NOTED. REFER TO TECHNICAL SPECIFICATIONS FOR PAINT SCHEDULE.
- SURFACE PREPARE, APPLY PRIMER AND TWO (2) COATS FINISH PAINT TO ALL EXTERIOR AND INTERIOR (SURFACES) OF SASH & FRAMES. WHERE NOTES INDICATE FINISH WORK, THIS MEANS BOTH THE INTERIOR AND EXTERIOR OF THE SASHES AND FRAMES. DO NOT PAINT THE JAMBS AT AREA OF SASH OPERATION. USE A TANNIN BLOCKING PRIMER FOR ALL INTERIOR FRAME AND TRIM WORK PRIOR TO PAINTING.
- ALL WINDOW SIZES INDICATED IN SCHEDULE ARE APPROXIMATE - IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY ALL CONDITIONS PRIOR TO ORDERING WINDOWS.

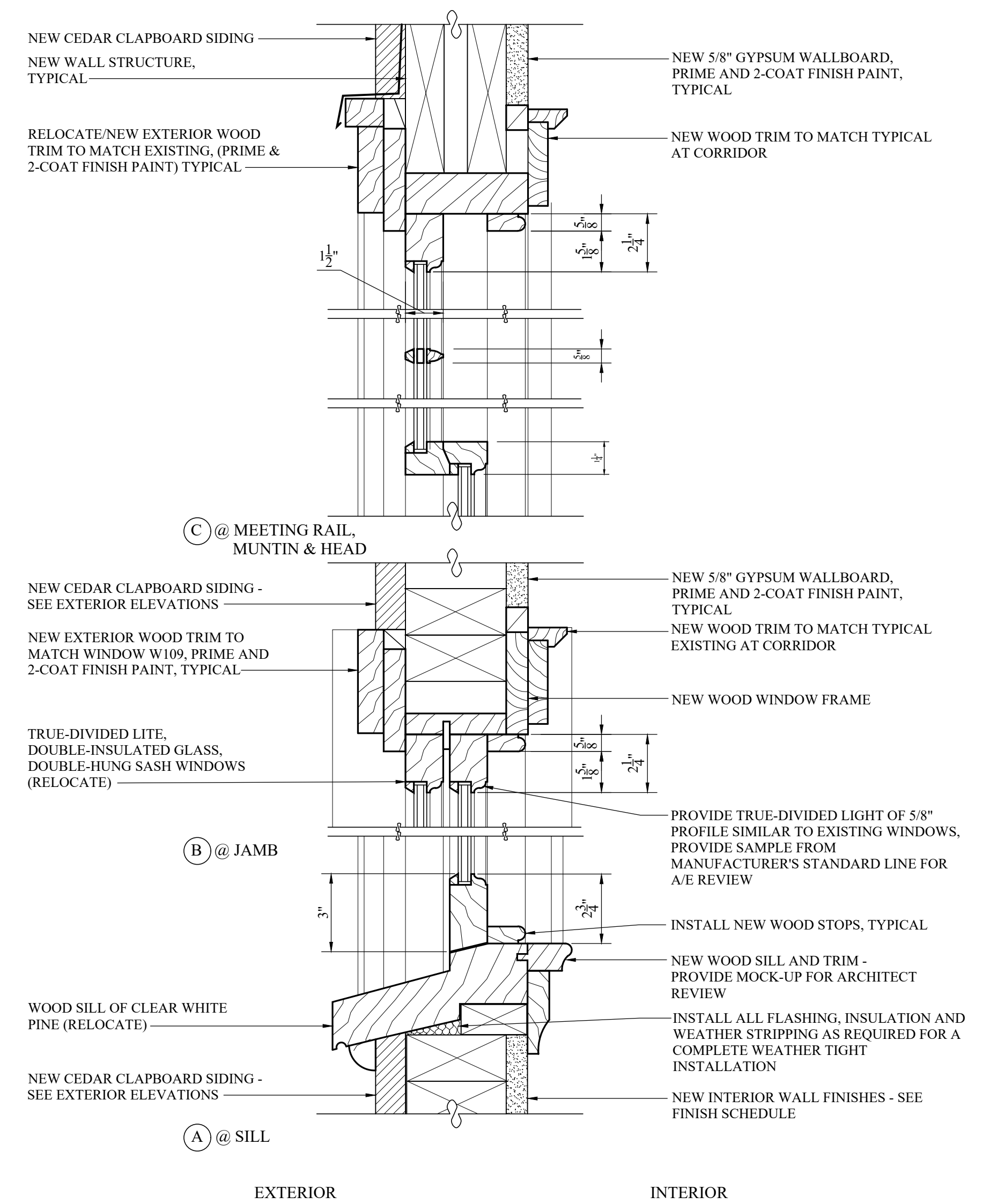


NOTES:
1. ROUGH OPENINGS AND LITE CONFIGURATIONS CHANGE BASED ON SIZE OF OPENING AND POSITION OF WINDOW.

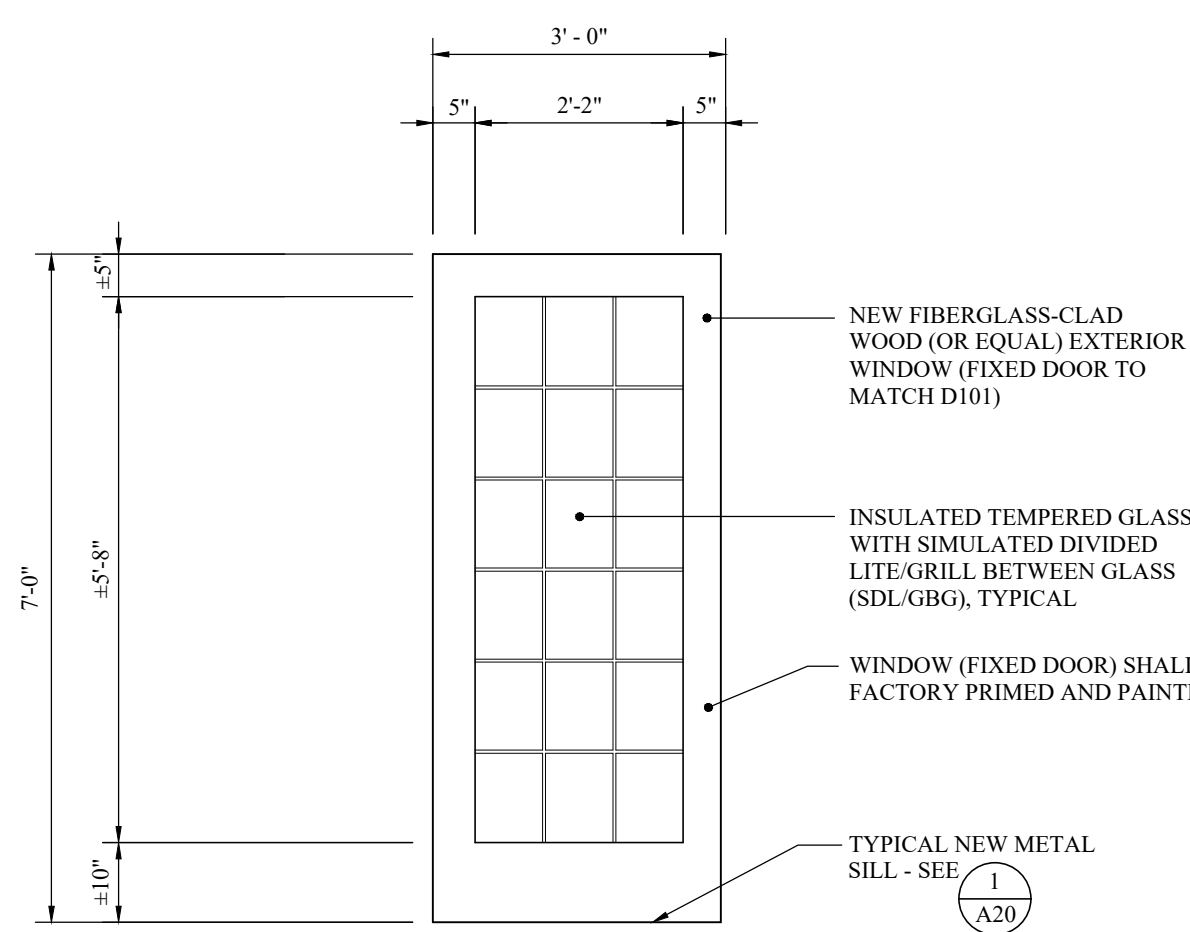
NOTE:
SHOP DRAWINGS MUST BE SUBMITTED AND APPROVED BY THE ARCHITECT PRIOR TO ORDERING THE WINDOWS. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR FIELD VERIFYING ALL DIMENSIONS AND CONDITIONS. COORDINATE SHOP DRAWINGS OF WINDOWS WITH ALL OTHER RELATED WORK, AS APPLICABLE.

EXTERIOR

3 WINDOW W106 ELEVATION
1" = 1' - 0"

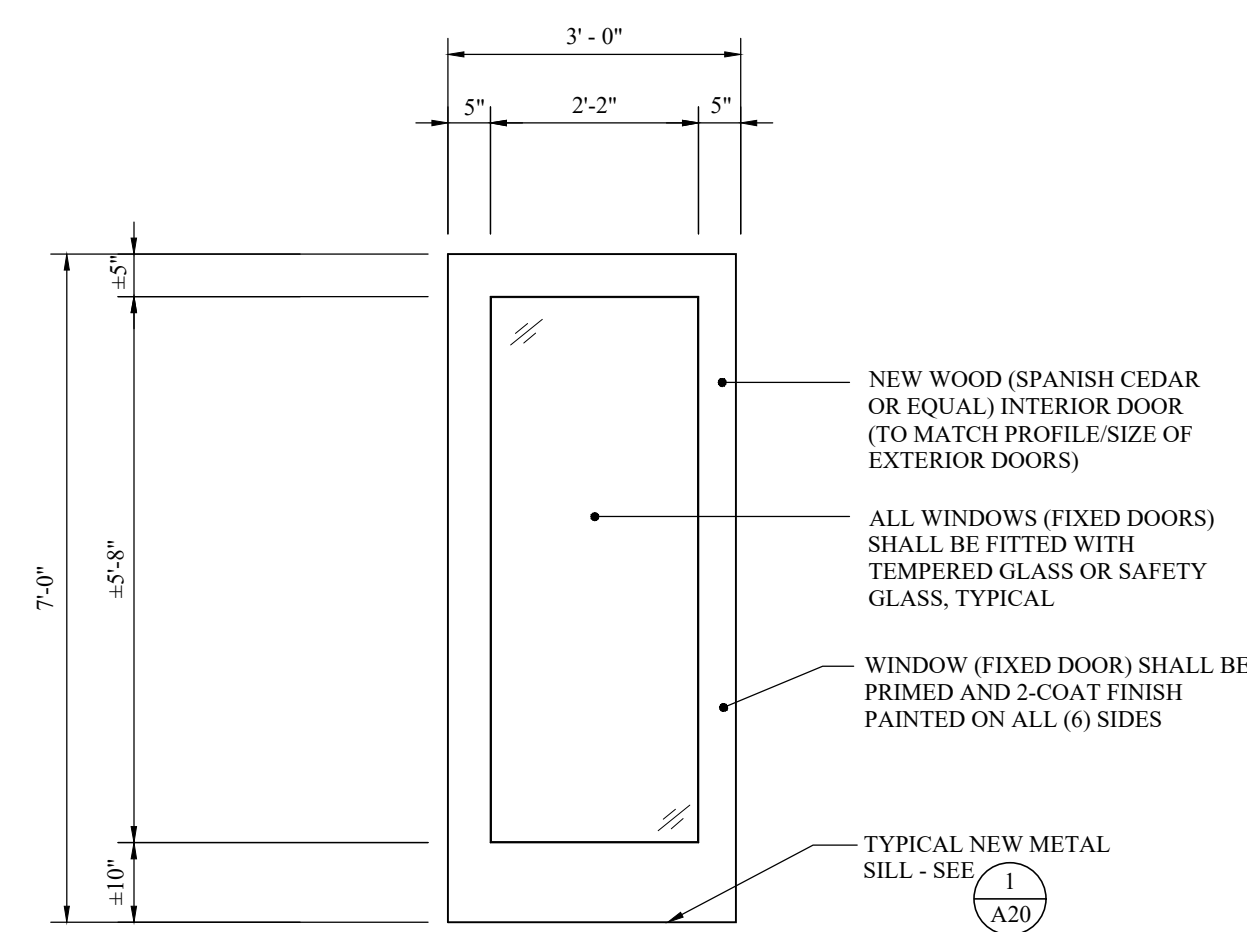


4 SECTION @ WINDOW W106
3" = 1' - 0"



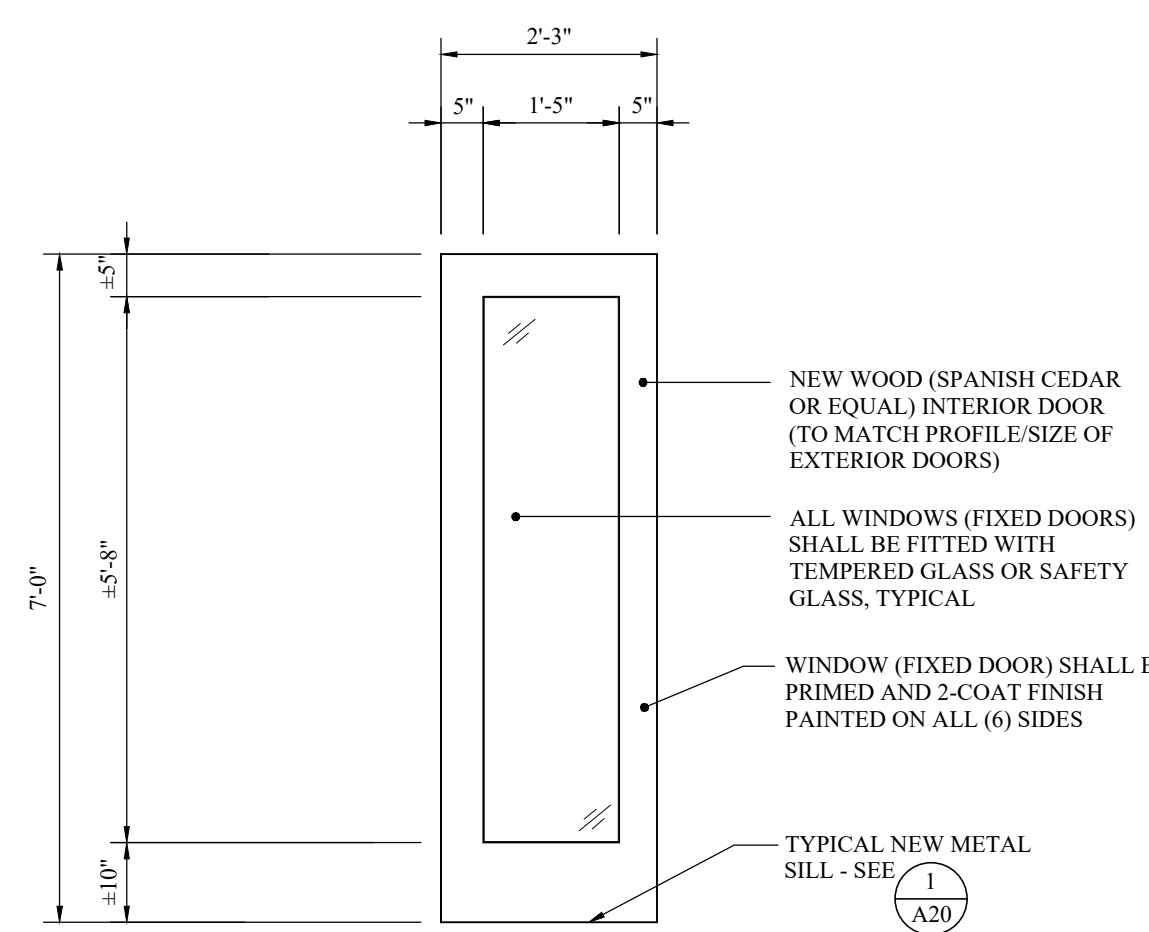
TYPE 1 3'-0" x 7'-0"
EXTERIOR - NEW

- W102 W110 W111 W112 W113 W114
W116 W117 W118 W119 W120



TYPE 2 3'-0" x 7'-0"
INTERIOR - NEW

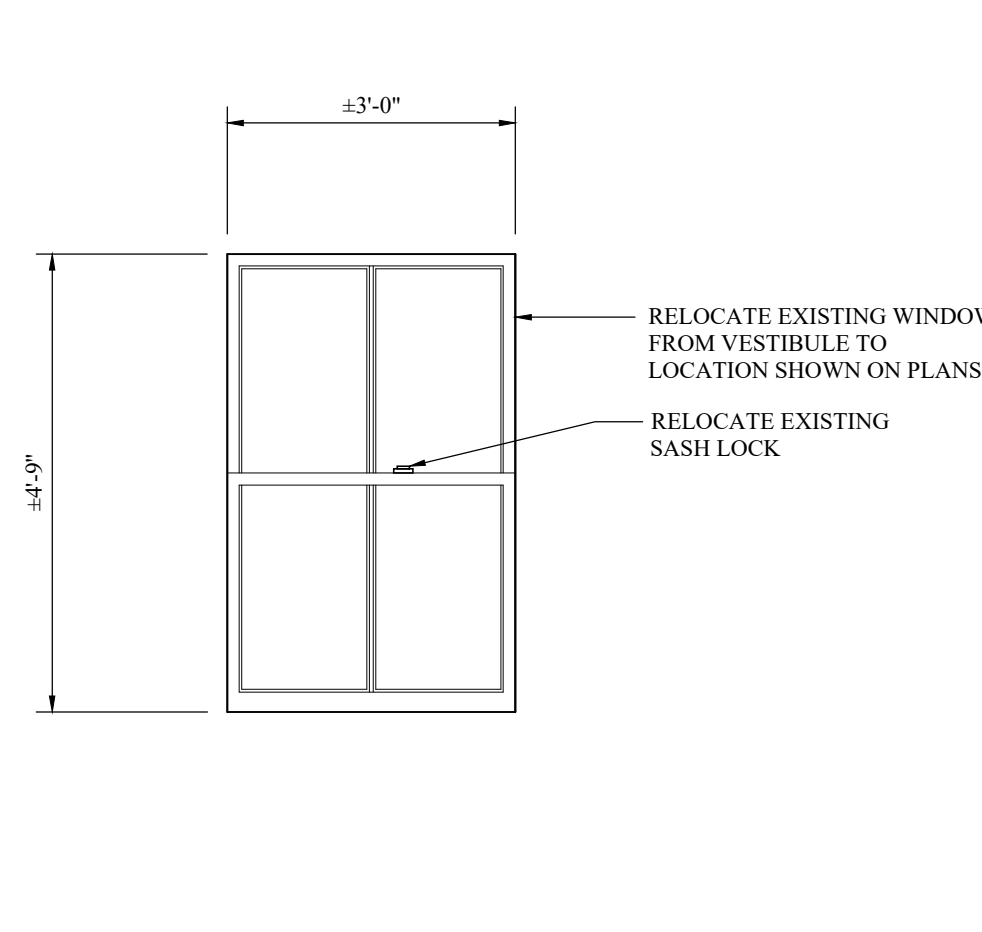
- W121 W123



TYPE 3 2'-3" x 7'-0"
INTERIOR - NEW

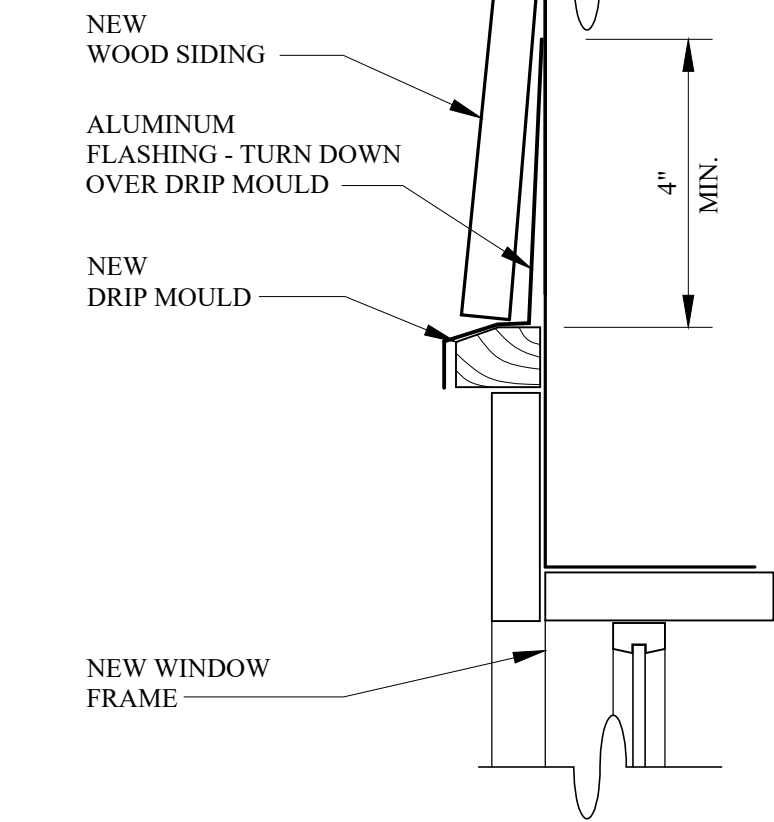
- W124 W125 W127 W128

C' LABEL - 20 MINUTE



TYPE 4 +/- 3'-0" x 4'-9"
EXTERIOR - RELOCATED EXISTING

- W106



WINDOW DRIP CAP FLASHING DETAIL
2 A21 N. T. S.

1 WINDOW TYPES
1/2" = 1' - 0"

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PROJECT No.: 1836C

DATE: 30 JUNE 2021

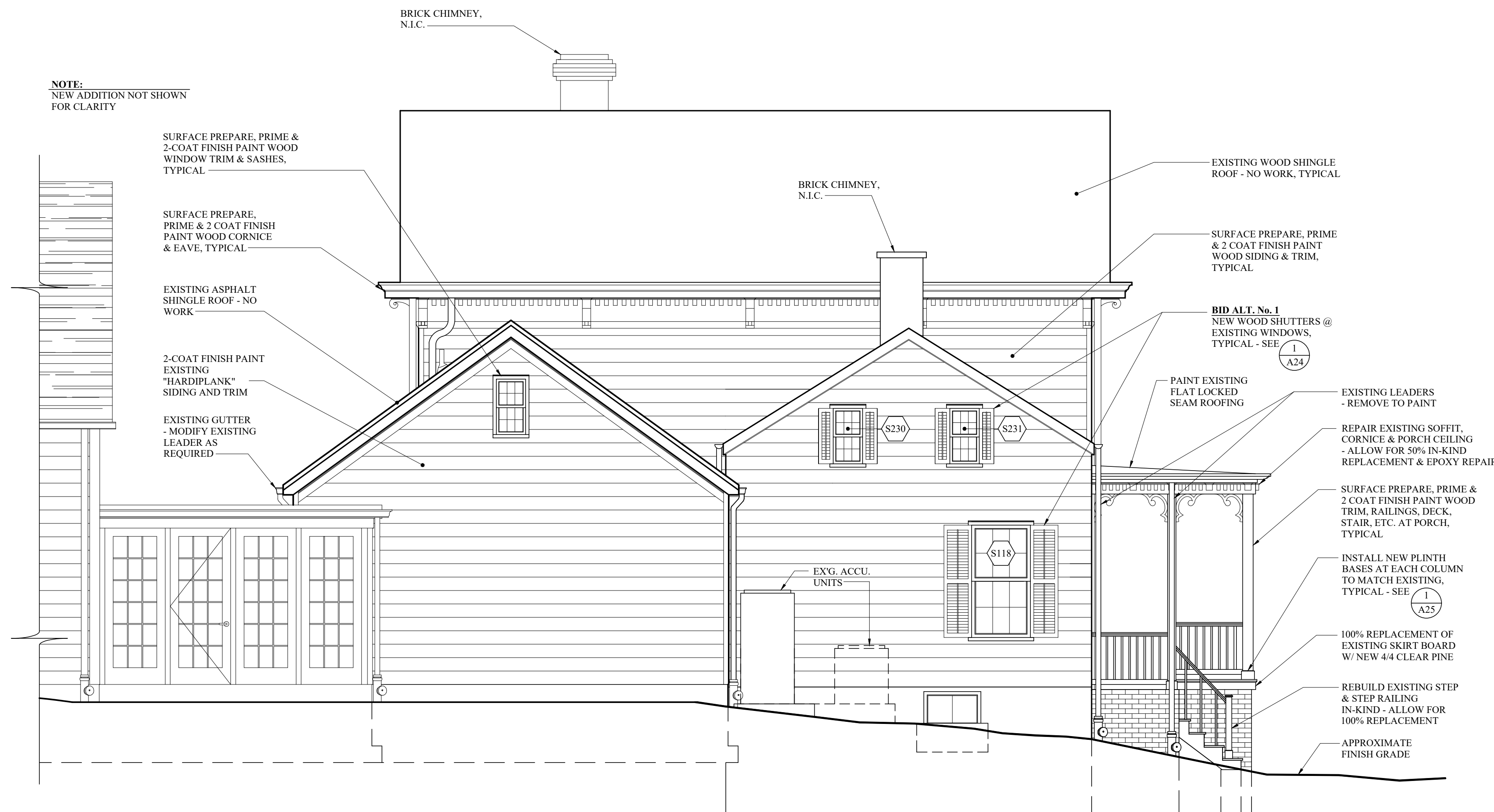
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RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
 TOWNSHIP OF PISCATAWAY
 MIDDLESEX COUNTY, NEW JERSEY

A21

NOTE:
NEW ADDITION NOT SHOWN
FOR CLARITY

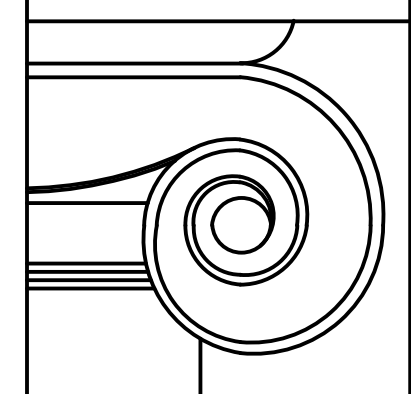


BID ALTERNATE No. 1
WEST ELEVATION

1/4" = 1' - 0"

FINISH CARPENTRY REPAIR NOTES

- GENERAL REPAIR NOTES:**
1. THE CONTRACTOR IS RESPONSIBLE FOR PROTECTING ADJACENCIES (SUCH AS PEOPLE, LAWN, WATER SOURCES, ETC.) DURING THE EXECUTION OF FINISH CARPENTRY REPAIRS AND SURFACE PREPARATION AND PAINTING.
 2. PROVIDE ADEQUATE MEANS BY WHICH WORKERS AND THE ARCHITECT SHALL HAVE ACCESS TO THE EXTERIOR OF THE BUILDING TO UNDERTAKE AND REVIEW THE WORK PROVIDING A SAFE WORKING ENVIRONMENT ACCORDING TO OSHA REQUIREMENTS AND OTHER REQUIREMENTS AS SET FORTH IN THE TECHNICAL SPECIFICATIONS.
- WOOD REPAIR NOTES:**
1. FILL ALL HOLES IN SHINGLED SIDING, TRIM, SOFFITS AND OTHER FINISH CARPENTRY COMPONENTS INCLUDING MINOR GAPS IN SIDING WITH APPROVED EPOXY OR WOOD FILLER. REFER TO TECHNICAL SPECIFICATIONS.
 2. UNDERTAKE ALL FINISH CARPENTRY REPAIRS INCLUDING EPOXY, DUTCHMAN AND UNIT REPLACEMENT REPAIRS PRIOR TO PAINTING. ALL NEW WOOD SHALL BE BACK PRIMED PRIOR TO INSTALLATION. REFER TO THE TECHNICAL SPECIFICATION FOR ADDITIONAL INFORMATION ON FINISH CARPENTRY RESTORATION.
 3. SURFACE PREPARE ALL NEW AND EXISTING WOOD SURFACES TO RECEIVE PRIMER AND (2) COATS FINISH PAINT. REMOVE ALL LOOSE OR FLAKING PAINT. SAND TO A FEATHERED EDGE AT HIGH POINTS AND WHERE THERE IS A BUILD-UP OF PAINT PROVIDING A SMOOTH PAINTABLE SURFACE. IT IS NOT THE INTENTION OF THIS PROJECT TO REMOVE ALL LAYERS OF EXISTING PAINT DUE TO THE HISTORIC NATURE OF THE EXISTING MATERIAL FABRIC.
 4. PROVIDE A MOCK-UP OF SURFACE PREPARATION TECHNIQUES FOR THE ARCHITECT'S REVIEW. THE APPROVED MOCK-UP SHALL REMAIN UNTIL ALL SURFACE PREPARATION HAS BEEN COMPLETED SERVING AS A MODEL FOR THE REMAINDER OF THE WORK. AT THE COMPLETION OF ALL SURFACE PREPARATION, THE MOCK-UP MAY BE MADE PART OF THE FINISHED WORK PRODUCT.
 5. THE ARCHITECT SHALL REVIEW SURFACE PREPARATION BEFORE PAINTING IS TO BEGIN.
 6. AT FINISH CARPENTRY, DOORS AND WINDOWS, PRIME AND (2) COAT FINISH PAINT ALL EXTERIOR FINISH CARPENTRY COMPONENTS INCLUDING BUT NOT LIMITED TO WINDOWS, FRAMES & TRIM AS SHOWN ON DRAWINGS.
 7. PROVIDE A PAINT MOCK-UP FOR THE ARCHITECT'S REVIEW. THE APPROVED MOCK-UP SHALL REMAIN UNTIL ALL PAINTING HAS BEEN COMPLETED SERVING AS A MODEL FOR THE REMAINDER OF THE WORK. AT THE COMPLETION OF PAINTING, THE MOCK-UP MAY BE MADE PART OF THE FINISHED WORK PRODUCT.
 8. AT WOOD SHINGLES, APPLY 2-COATS OF SOLID COLOR WATER-BOURNE STAIN TO MATCH EXISTING.



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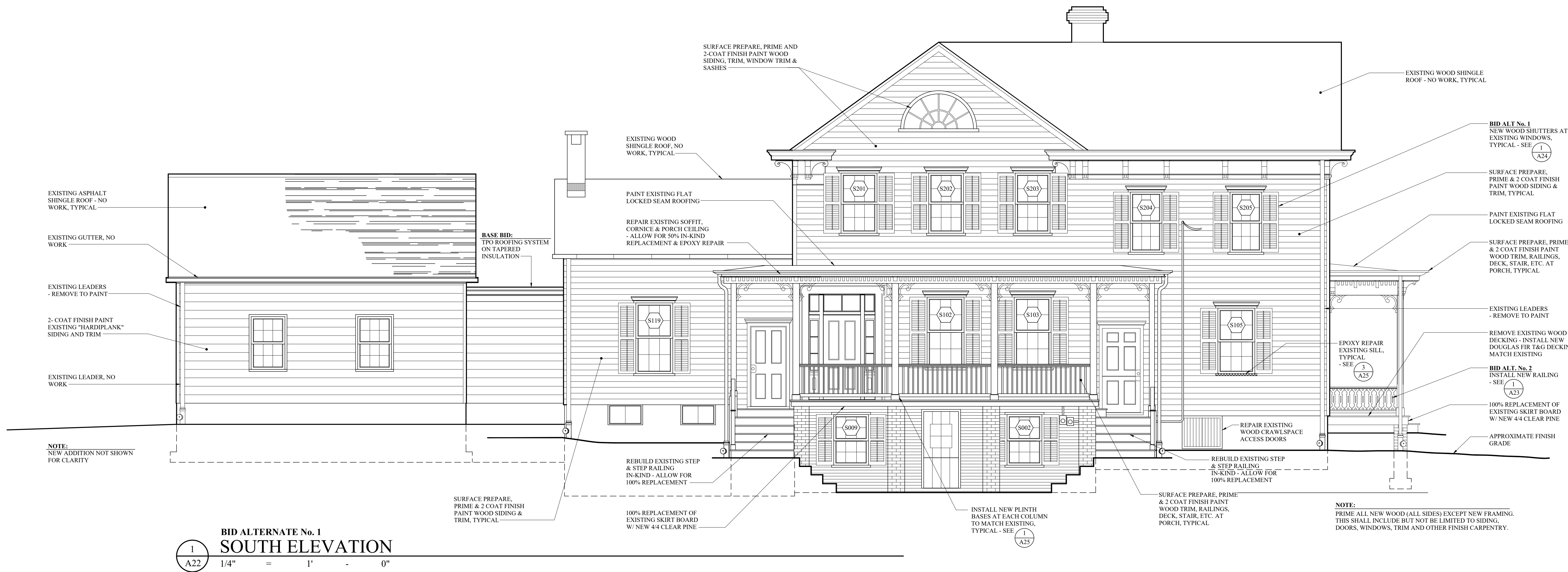
PROJECT No. : 1836C
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REVISIONS :

DRAWN BY - TBC, MMH, MS

RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
TOWNSHIP OF PISCATAWAY
MIDDLESEX COUNTY, NEW JERSEY

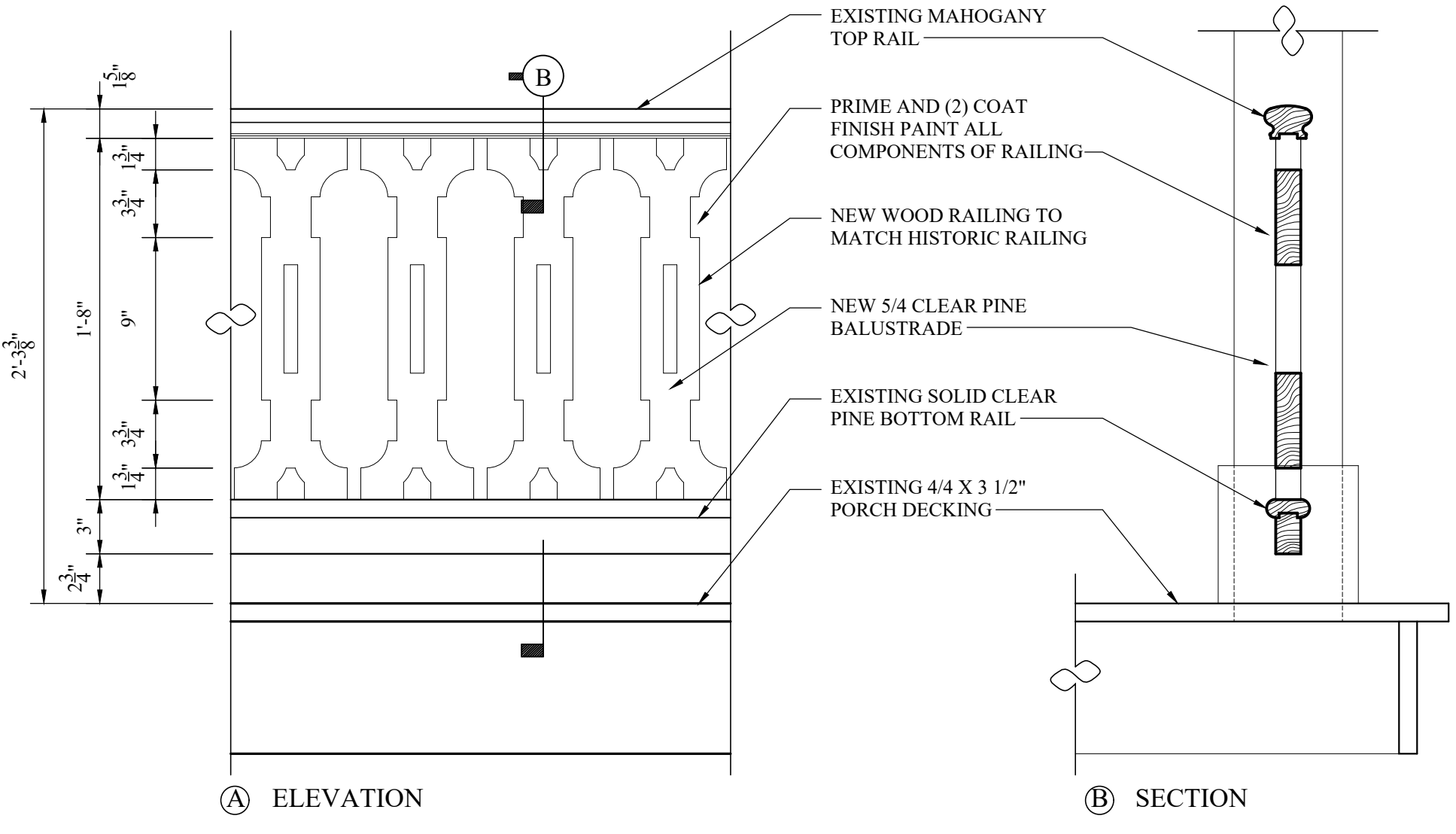
BID ALTERNATE No. 1

A22



BID ALTERNATE No. 1
SOUTH ELEVATION

1/4" = 1' - 0"



3 EAST PORCH BALUSTER DETAIL
 1 1/2" = 1' - 0"

BID ALTERNATE No. 1
 NEW WOOD SHUTTERS AT EXISTING WINDOWS, TYPICAL - SEE 1 (A24)

REPAIR EXISTING SOFFIT, CORNICE & PORCH CEILING - ALLOW FOR 50% IN-KIND REPLACEMENT & EPOXY REPAIR

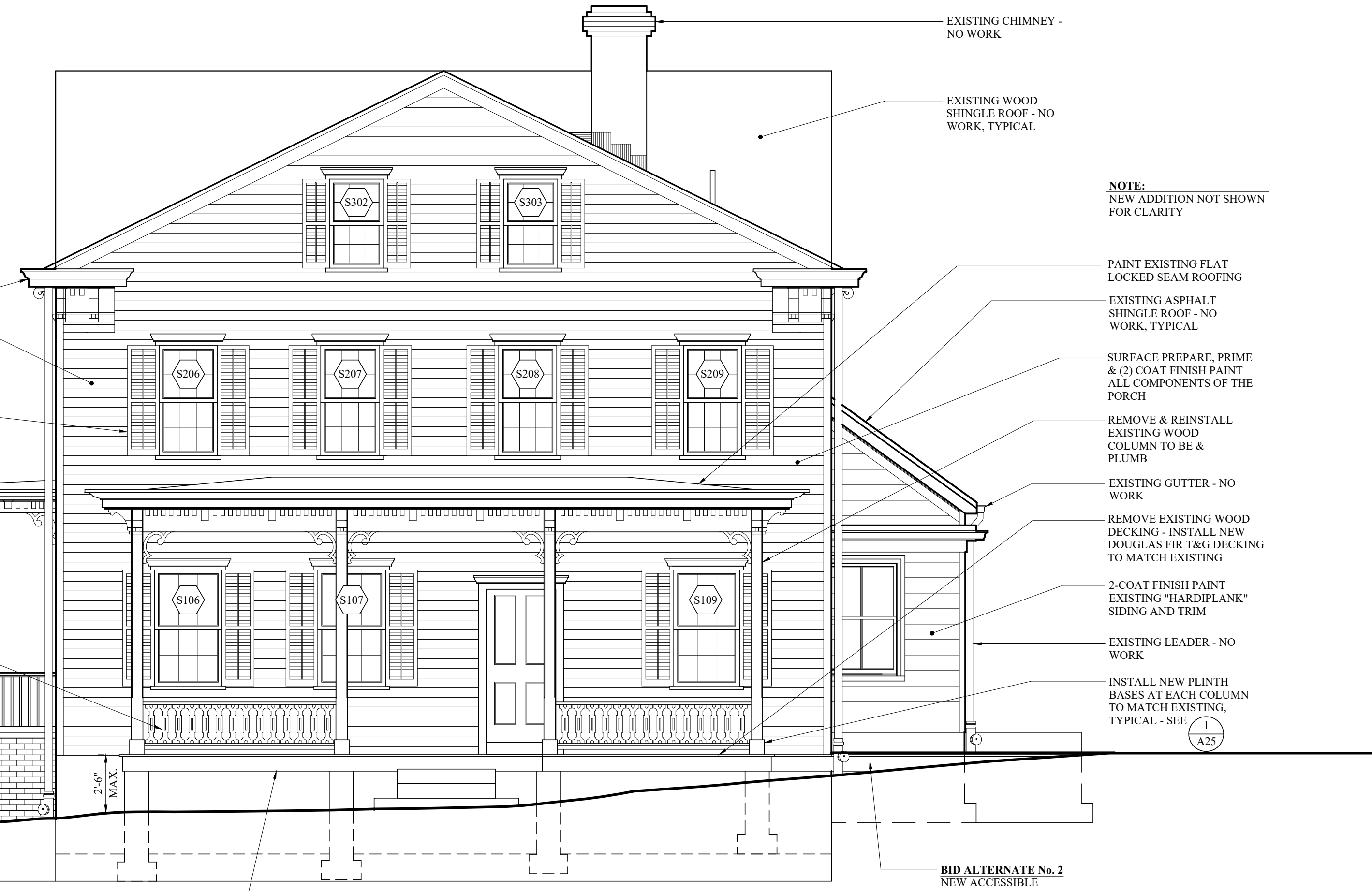
BID ALT. No. 2
 INSTALL NEW WOOD RAILING @ SIDE PORCH - SEE 3 (S23)

REMOVE EXISTING WOOD DECKING - INSTALL NEW DOUGLAS FIR T&G DECKING TO MATCH EXISTING

REBUILD EXISTING STEP & STEP RAILING IN-KIND - ALLOW FOR 100% REPLACEMENT

APPROXIMATE FINISH GRADE

NOTE:
 PRIME ALL NEW WOOD (ALL SIDES) EXCEPT NEW FRAMING. THIS SHALL INCLUDE BUT NOT BE LIMITED TO SIDING, DOORS, WINDOWS, TRIM AND OTHER FINISH CARPENTRY.



2 BID ALTERNATE No. 1 EAST ELEVATION
 1/4" = 1' - 0"

NOTE:
 NEW ADDITION NOT SHOWN FOR CLARITY

EXISTING ASPHALT SHINGLE ROOF - NO WORK, TYPICAL

PAIN EXISTING FLAT LOCKED SEAM ROOFING

REMOVE & REINSTALL EXISTING WOOD COLUMN TO BE & PLUMB

EXISTING GUTTER - NO WORK

REMOVE EXISTING WOOD DECKING - INSTALL NEW DOUGLAS FIR T&G DECKING TO MATCH EXISTING

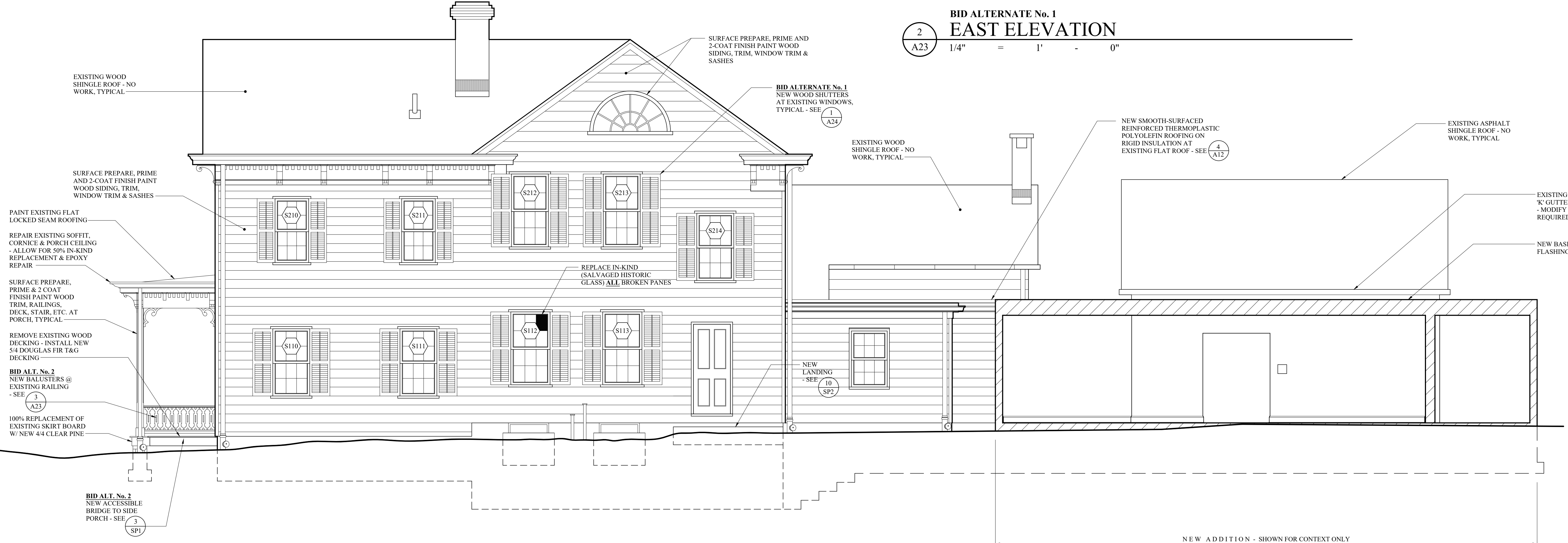
2-COAT FINISH PAINT EXISTING "HARDPLANK" SIDING AND TRIM

EXISTING LEADER - NO WORK

INSTALL NEW PLINTH BASES AT EACH COLUMN TO MATCH EXISTING, TYPICAL - SEE 1 (A25)

BID ALTERNATE No. 2
 NEW ACCESSIBLE BRIDGE TO SIDE PORCH - SEE 3 (SP1)

100% REPLACEMENT OF EXISTING SKIRT BOARD W/ NEW 4x4 CLEAR PINE



1 BID ALTERNATE No. 1 NORTH ELEVATION
 1/4" = 1' - 0"

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PROJECT No.: 1836C
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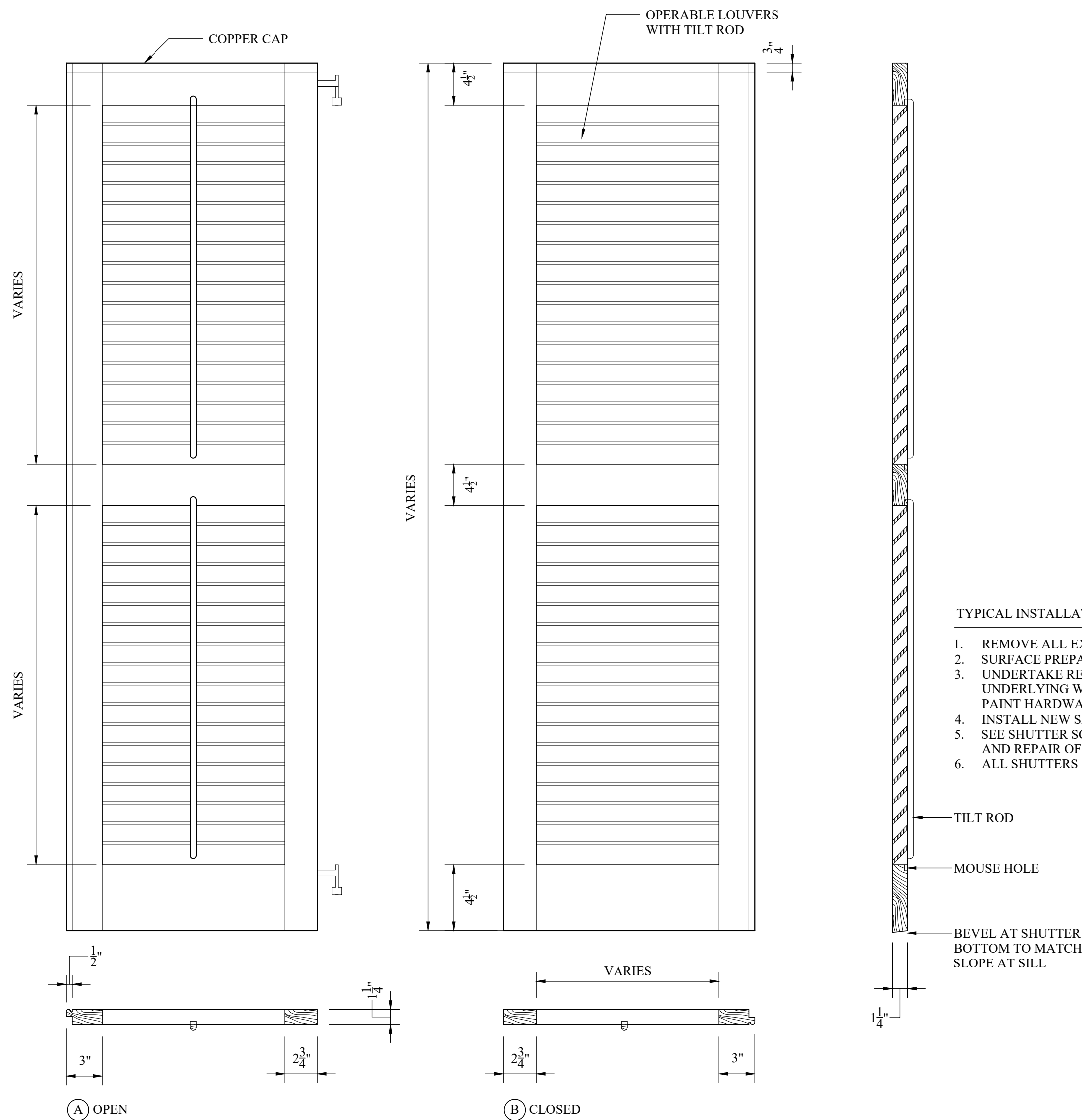
BID ALTERNATE No. 1
A23

SHUTTER REPAIR SCHEDULE

| WINDOW NO. | SHUTTER CONFIGURATION | SHUTTER SIZE | SHUTTER REPAIR | HARDWARE REPAIR |
|------------|-----------------------------------|---------------------------|---|--|
| S002 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 4' - 0" | REPLACE WOOD SHUTTERS TO MATCH TYPICAL EXISTING. SURFACE PREPARE, PRIME & 2-COAT FINISH PAINT (SEE DETAIL). | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S009 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 4' - 0" | REPLACE WOOD SHUTTERS TO MATCH TYPICAL EXISTING. SURFACE PREPARE, PRIME & 2-COAT FINISH PAINT (SEE DETAIL). | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S102 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 5' - 7" | REPLACE WOOD SHUTTERS TO MATCH TYPICAL EXISTING. SURFACE PREPARE, PRIME & 2-COAT FINISH PAINT (SEE DETAIL). | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S103 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 5' - 7" | REPLACE WOOD SHUTTERS TO MATCH TYPICAL EXISTING. SURFACE PREPARE, PRIME & 2-COAT FINISH PAINT (SEE DETAIL). | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S105 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 5' - 2" | REPLACE WOOD SHUTTERS TO MATCH TYPICAL EXISTING. SURFACE PREPARE, PRIME & 2-COAT FINISH PAINT (SEE DETAIL). | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S106 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 5' - 0" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S107 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 5' - 0" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S109 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 5' - 0" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S110 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 5' - 0" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S111 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 5' - 0" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S112 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 5' - 5" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S113 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 5' - 5" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S118 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 5' - 7" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S119 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 5' - 7" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S201 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 4' - 9" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S202 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 4' - 9" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |

SHUTTER REPAIR SCHEDULE

| WINDOW NO. | SHUTTER CONFIGURATION | SHUTTER SIZE | SHUTTER REPAIR | HARDWARE REPAIR |
|------------|-----------------------------------|---------------------------|---|--|
| S203 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 4' - 9" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S204 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 4' - 9" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S205 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 4' - 9" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S206 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 4' - 9" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S207 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 4' - 9" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S208 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 4' - 9" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S209 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 4' - 9" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S210 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 4' - 9" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S211 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 4' - 9" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S212 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 5' - 5" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S213 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 5' - 5" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S214 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 4 1/2" X 5' - 0" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S230 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 0' - 8 3/4" X 2' - 9" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S231 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 0' - 8 3/4" X 2' - 9" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S302 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 2" X 3' - 10" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |
| S303 | (1) PAIR, 2-LOUVERED WOOD SHUTTER | (2) 1' - 2" X 3' - 10" | REPAIR EXISTING WOOD SHUTTERS. ALLOW FOR REPLACEMENT OF TWO VERTICAL RAILS (OR EQUAL) SURFACE PREPARE, PRIME & 2-COAT PAINT | REUSE EXISTING. SURFACE PREPARE, APPLY RUST-INHIBITED PRIMER & 2-COAT PAINT EXISTING HARDWARE. |



SHUTTER NOTES:

- ALL EXISTING SHUTTERS SHALL BE REPLACED WITH NEW. ALL EXISTING HARDWARE SHALL BE REUSED AND REPAINTED.
- IN EXECUTION OF PAINTING PROCEDURES, SURFACE PREPARE, PRIME AND 2-COAT FINISH PAINT ALL SIX (6) SIDES OF THE SHUTTERS. SURFACE PREPARATION AND PAINTING PROCESSES WILL OCCUR BEFORE SHUTTERS ARE INSTALLED.
- IN EXECUTION OF PAINTING PROCEDURES, TAKE CARE THAT LOUVERS ARE NOT PAINTED SO THEY NO LONGER OPERATE.
- PAINTING OF HARDWARE INCLUDES NOT ONLY THE HINGES BUT PINTLES, SHUTTER DOGS AND OTHER ATTACHMENTS. DO NOT PAINT SO THAT THE PAINT INHIBITS OPERATION.
- PROVIDE SHOP DRAWINGS FOR NEW SHUTTERS.
- ALLOW TO REPLACE (3) PAIR OF SHUTTER HARDWARE TO MATCH EXISTING IN KIND.

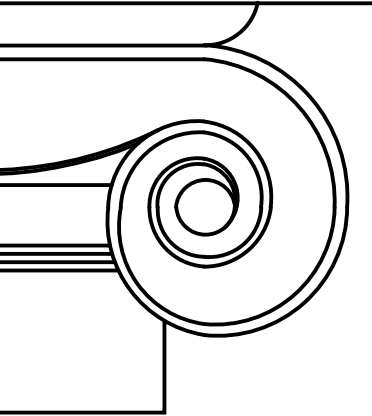
TYPICAL INSTALLATION PROCEDURES / SEQUENCE OF PROCEDURES:

- REMOVE ALL EXISTING SHUTTERS AND HARDWARE.
- SURFACE PREPARE, PRIME AND 2-COAT FINISH PAINT THE NEW SHUTTERS.
- UNDERTAKE REPAIRS AT HARDWARE, TYPICAL: REMOVE HARDWARE; REPAIR UNDERLYING WOOD WITH DUTCHMEN AND EPOXY, PRIME AND 2-COAT FINISH PAINT HARDWARE; AND REINSTALL.
- INSTALL NEW SHUTTERS USING EXISTING HARDWARE.
- SEE SHUTTER SCHEDULE FOR ADDITIONAL INFORMATION ON NEW SHUTTERS AND REPAIR OF EXISTING HARDWARE.
- ALL SHUTTERS SHALL BE OPERATIONAL AT COMPLETION OF THE WORK.

TILT ROD
 MOUSE HOLE
 BEVEL AT SHUTTER BOTTOM TO MATCH SLOPE AT SILL

1
 A24

1/4" = 1' - 0"



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PROJECT No. : 1836C

DATE : 30 JUNE 2021

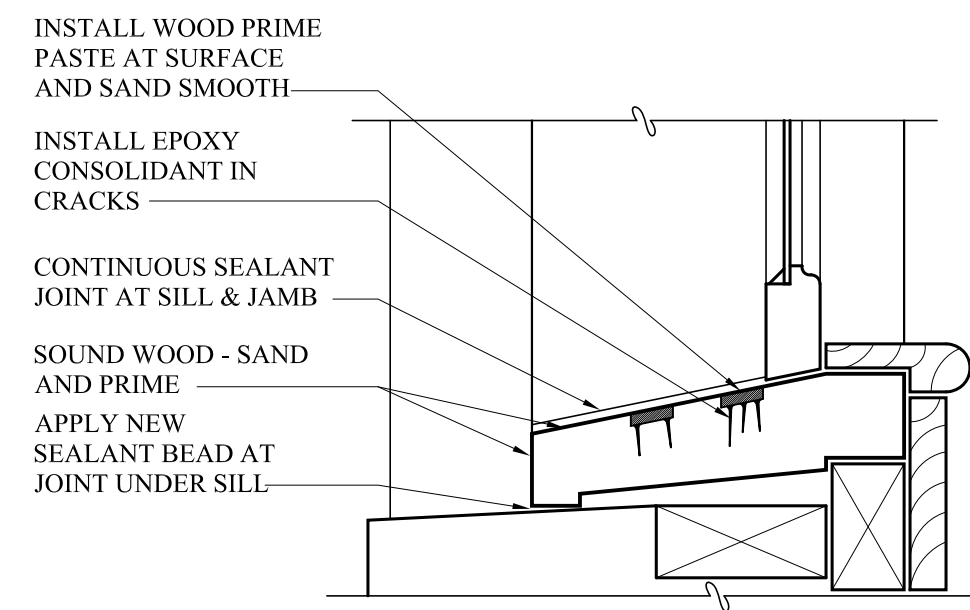
REVISIONS :

DRAWN BY - TBC, MMH, MS

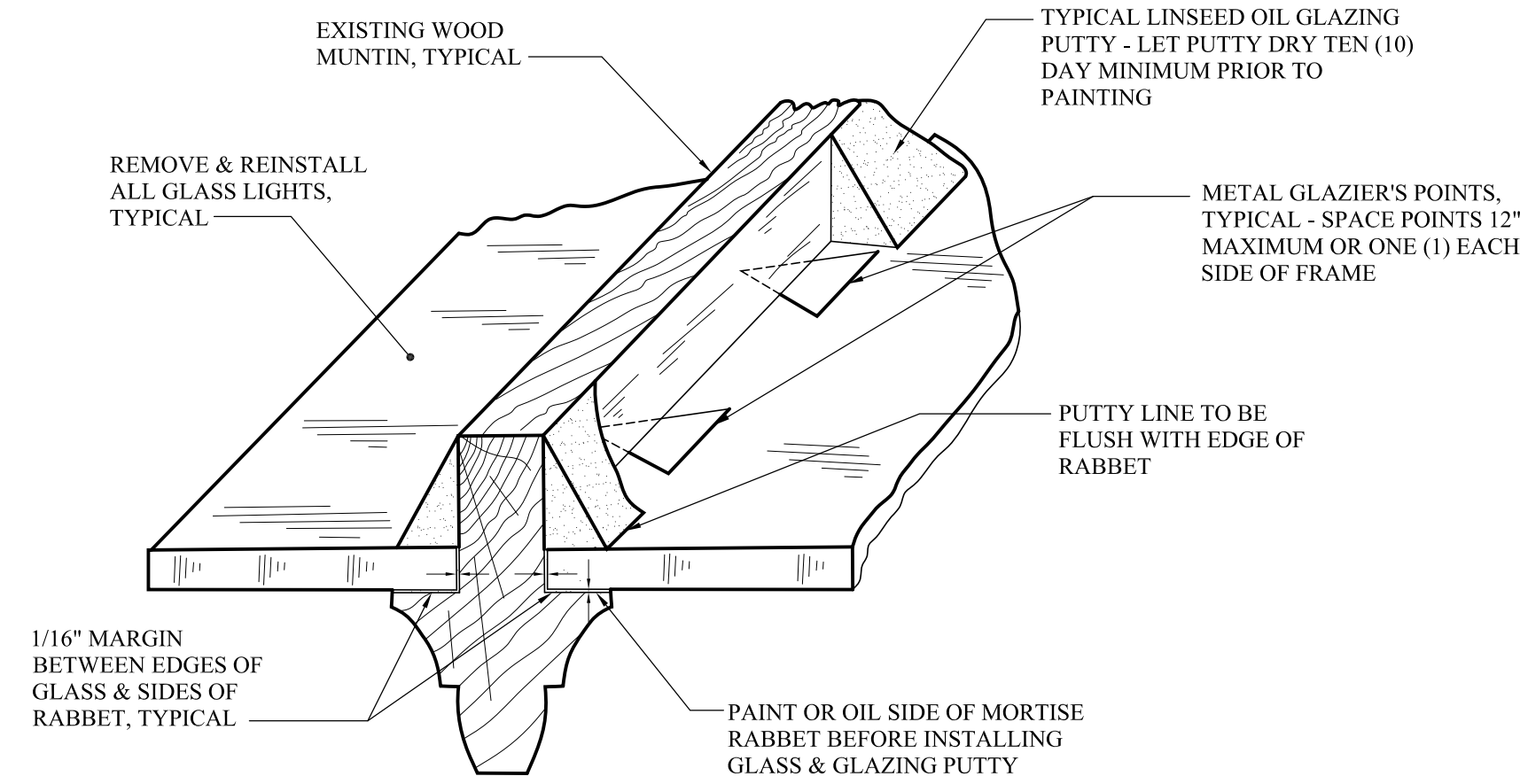
RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
 TOWNSHIP OF PISCATAWAY
 MIDDLESEX COUNTY, NEW JERSEY

BID ALTERNATE No. 1

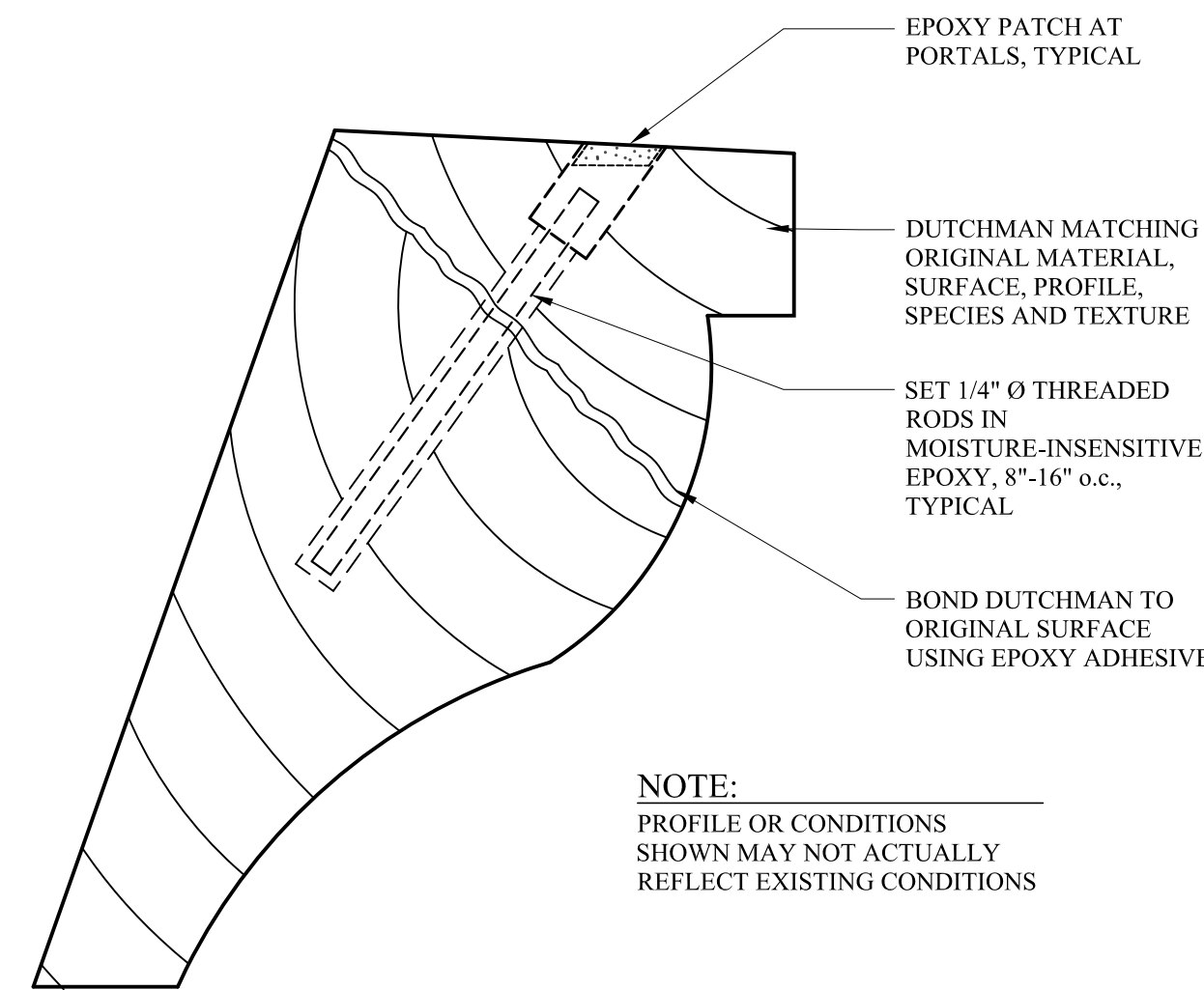
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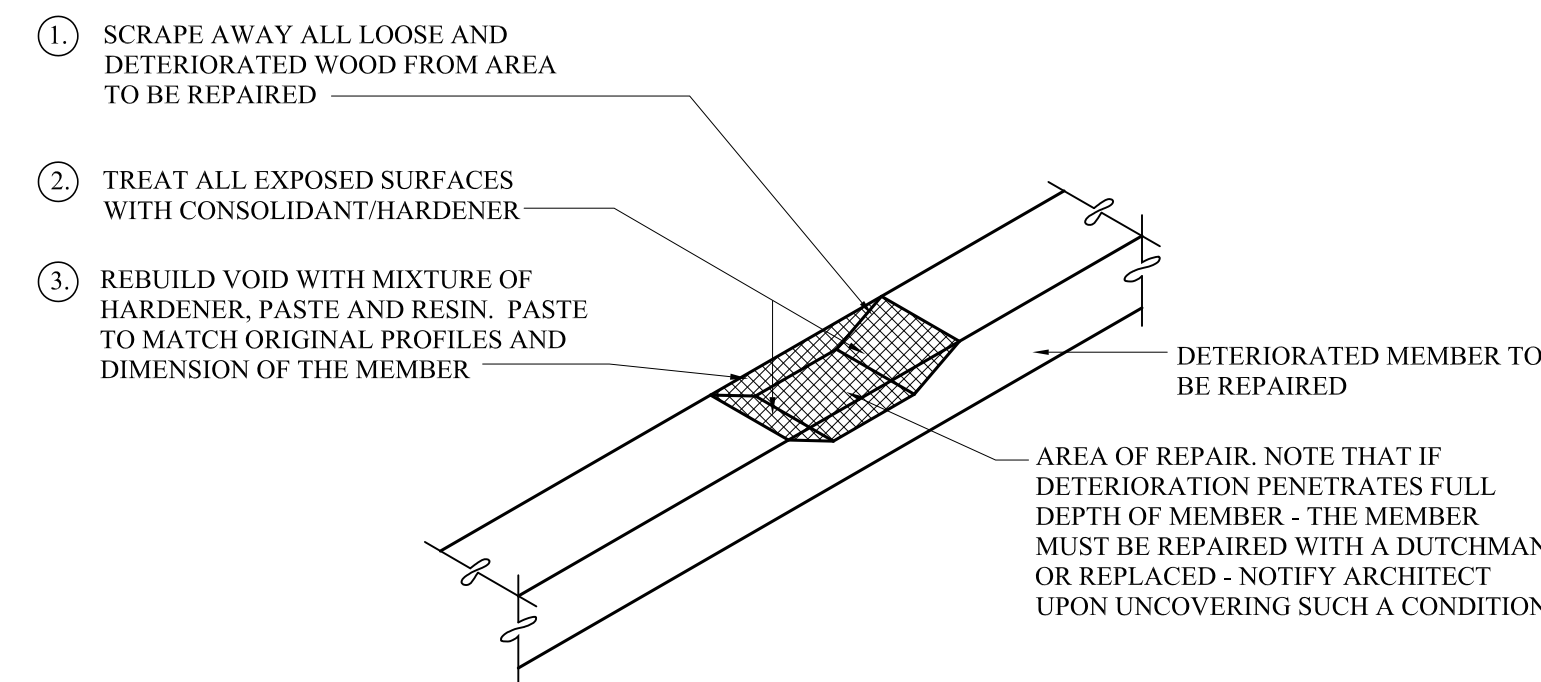
3 SILL REPAIR DETAIL
A25 N. T. S.



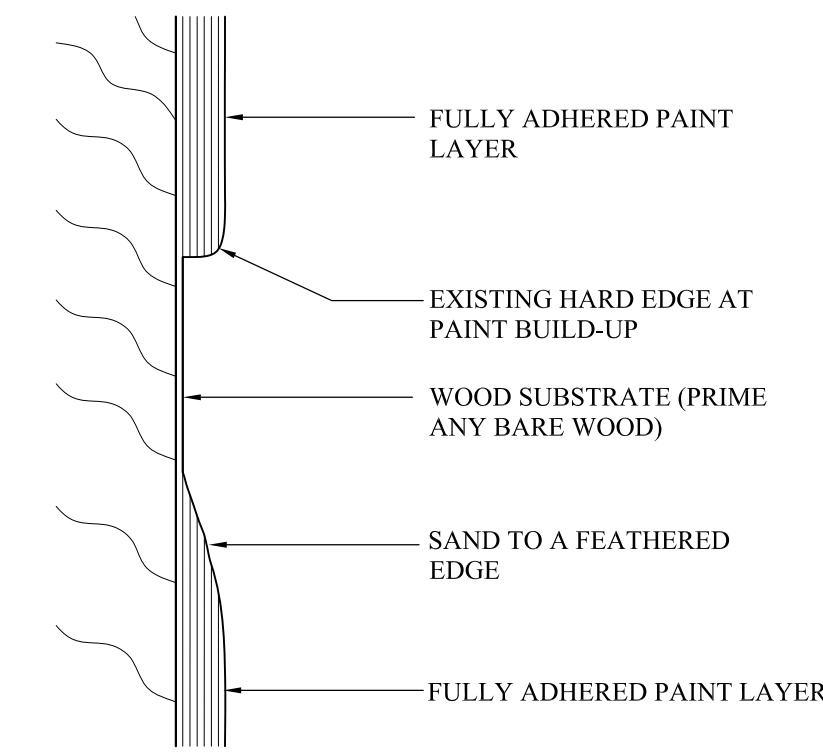
4 GLAZING PUTTY DETAIL
A25 N. T. S.



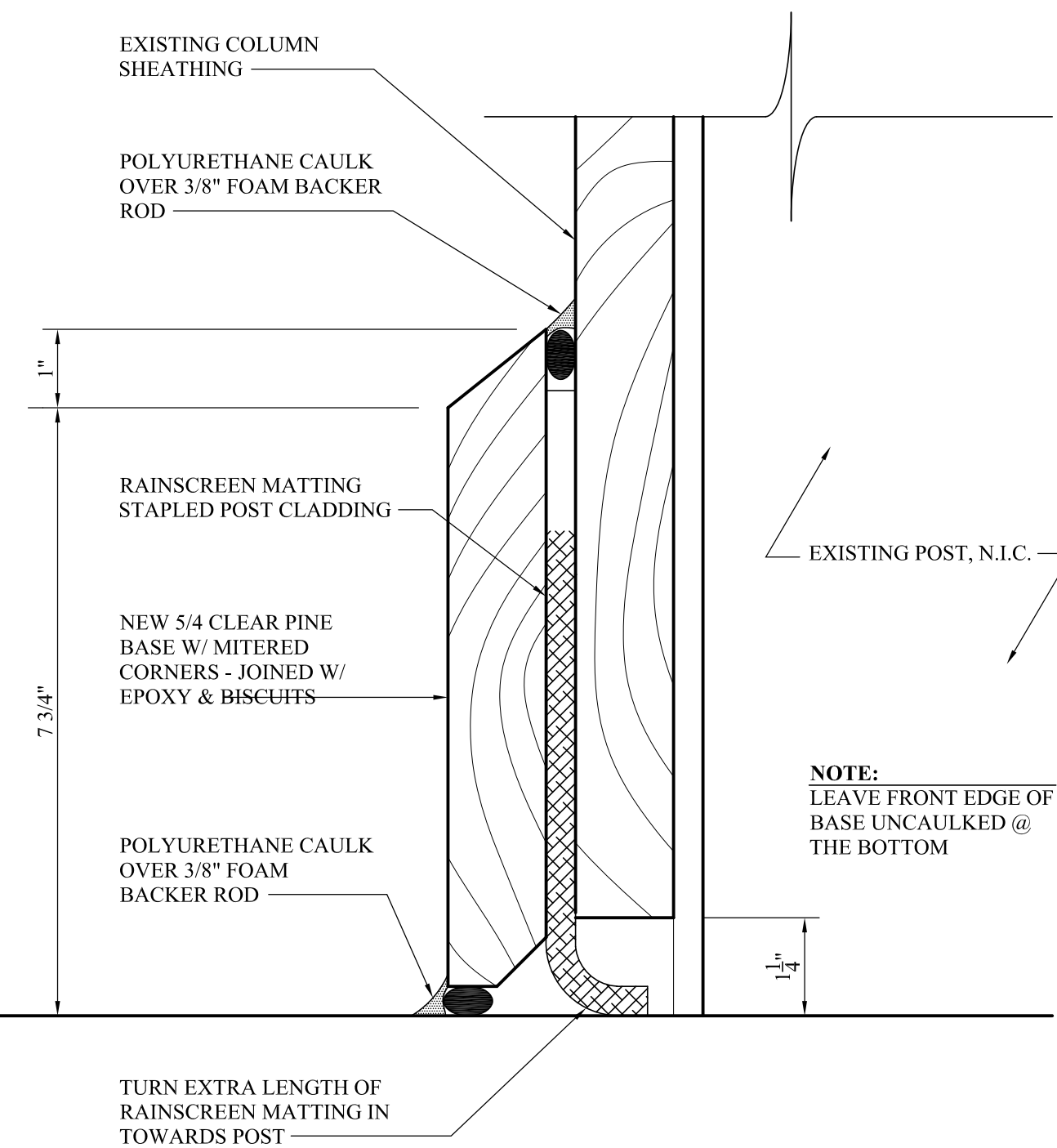
2 WOOD DUTCHMAN REPAIR
A25 N. T. S.



5 EPOXY REPAIR DETAIL
A25 N. T. S.



7 SURFACE PREPARATION DETAIL
A25 N. T. S.



1 PORCH COLUMN BASE DETAIL
A25 6" = 1' - 0"

WOOD EPOXY DETAIL

A MINOR DAMAGE (SPONGY)

- DRILL HOLES 4 - 8 INCHES O.C.
- INSTALL TEMPORARY FORM AS REQUIRED
- MIX RESIN & HARDENER* TOGETHER IN SQUEEZE BOTTLE
- LET SET FOR 5 MINUTES (INDUCTION TIME)
- SQUEEZE LIQUID INTO PRE-DRILLED HOLES
- ALLOW 24 HOURS CURING TIME
- REMOVE FORM

B MAJOR DAMAGE (DECOMPOSED)

- REMOVE ALL DAMAGED DETERIORATED WOOD
- PRIME W/LIQUID RESIN & HARDENER AS ABOVE* (3-5)
- INSTALL TEMPORARY FORMS AS REQUIRED
- MIX RESIN & HARDENER** TOGETHER INTO WORKABLE PASTE
- LET SET FOR 10 MINUTES (INDUCTION TIME)
- WORK PASTE INTO VOIDS - SMOOTH SURFACE W/SPACKLE KNIFE

GENERAL NOTES

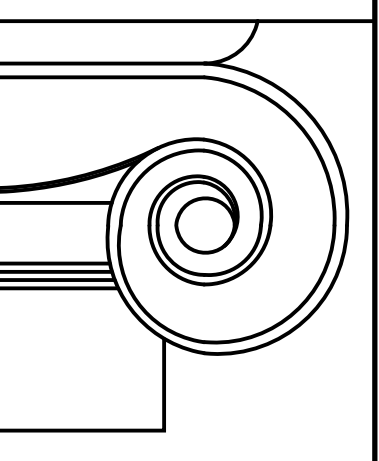
- INSTALLER AND HANDLERS SHALL WEAR PROTECTIVE MASKS, GLOVES AND CLOTHING AS PER MANUFACTURERS LATEST PRECAUTIONS
- "LIQUIDWOOD" AND "WOODPOX" ARE PROPRIETARY PRODUCTS AS MANUFACTURED BY ABATRON, INC. GILBERT, ILLINOIS. CONSULT MANUFACTURERS LATEST SPECIFICATIONS FOR USE.
- TOTAL CURING TIME VARIES ACCORDING TO TEMPERATURES.
- MATERIALS MAY BE NAILED, DRILLED, SAWN, PLANED AND PAINTED UPON CURING.
- FOR ORNAMENTAL CARPENTRY REPAIR, MATCH EXISTING PROFILES EXACTLY.

6 WOOD EPOXY DETAIL
A25 N. T. S.

FINISH CARPENTRY REPAIR NOTES

- GENERAL REPAIR NOTES:**
- THE CONTRACTOR IS RESPONSIBLE FOR PROTECTING ADJACENCIES (SUCH AS PEOPLE, LAWN, WATER SOURCES, ETC.) DURING THE EXECUTION OF FINISH CARPENTRY REPAIRS AND SURFACE PREPARATION AND PAINTING.
 - PROVIDE ADEQUATE MEANS BY WHICH WORKERS AND THE ARCHITECT SHALL HAVE ACCESS TO THE EXTERIOR OF THE BUILDING TO UNDERTAKE AND REVIEW THE WORK PROVIDING A SAFE WORKING ENVIRONMENT ACCORDING TO OSHA REQUIREMENTS AND OTHER REQUIREMENTS AS SET FORTH IN THE TECHNICAL SPECIFICATIONS.
 - PROVIDE A MOCK-UP OF SURFACE PREPARATION TECHNIQUES FOR THE ARCHITECT'S REVIEW. THE APPROVED MOCK-UP SHALL REMAIN UNTIL ALL SURFACE PREPARATION HAS BEEN COMPLETED SERVING AS A MODEL FOR THE REMAINDER OF THE WORK. AT THE COMPLETION OF ALL SURFACE PREPARATION, THE MOCK-UP MAY BE MADE PART OF THE FINISHED WORK PRODUCT.
 - THE ARCHITECT SHALL REVIEW SURFACE PREPARATION BEFORE PAINTING IS TO BEGIN.
 - AT FINISH CARPENTRY, DOORS AND WINDOWS: PRIME AND (2) COAT FINISH PAINT ALL EXTERIOR FINISH CARPENTRY COMPONENTS INCLUDING BUT NOT LIMITED TO WINDOWS, FRAMES & TRIM AS SHOWN ON DRAWINGS.
 - PROVIDE A PAINT MOCK-UP FOR THE ARCHITECT'S REVIEW. THE APPROVED MOCK-UP SHALL REMAIN UNTIL ALL PAINTING HAS BEEN COMPLETED SERVING AS A MODEL FOR THE REMAINDER OF THE WORK. AT THE COMPLETION OF PAINTING, THE MOCK-UP MAY BE MADE PART OF THE FINISHED WORK PRODUCT.
 - AT WOOD SHINGLES, APPLY 2-COATS OF SOLID COLOR WATER-BOURNE STAIN TO MATCH EXISTING.
- WOOD REPAIR NOTES:**
- FILL ALL HOLES IN SHINGLED SIDING, TRIM, SOFFITS AND OTHER FINISH CARPENTRY COMPONENTS INCLUDING MINOR GAPS IN SIDING WITH APPROVED EPOXY OR WOOD FILLER. REFER TO TECHNICAL SPECIFICATIONS.
 - UNDERTAKE ALL FINISH CARPENTRY REPAIRS INCLUDING EPOXY, DUTCHMAN AND UNIT REPLACEMENT REPAIRS PRIOR TO PAINTING. ALL NEW WOOD SHALL BE BACK PRIMED PRIOR TO INSTALLATION. REFER TO THE TECHNICAL SPECIFICATION FOR ADDITIONAL INFORMATION ON FINISH CARPENTRY RESTORATION.
 - SURFACE PREPARE ALL NEW AND EXISTING WOOD SURFACES TO RECEIVE PRIMER AND (2) COATS FINISH PAINT. REMOVE ALL LOOSE OR FLAKING PAINT. SAND TO A FEATHERED EDGE AT HIGH POINTS AND WHERE THERE IS A BUILD-UP OF PAINT PROVIDING A SMOOTH PAINTABLE SURFACE. IT IS NOT THE INTENTION OF THIS PROJECT TO REMOVE ALL LAYERS OF EXISTING PAINT DUE TO THE HISTORIC NATURE OF THE EXISTING MATERIAL FABRIC.

- NOTES:**
- SURFACE PREPARE ALL NEW AND EXISTING WOOD SURFACES TO RECEIVE PRIMER AND (2) COATS FINISH PAINT AS INDICATED ON THE DRAWINGS.
 - REMOVE ALL LOOSE OR FLAKING PAINT WITH SCRAPERS WITHOUT GAUGING THE WOOD.
 - SAND TO A FEATHERED EDGE AT HIGH POINTS AND WHERE THERE IS A BUILD-UP OF PAINT PROVIDING A SMOOTH PAINTABLE SURFACE.
 - IT IS NOT THE INTENTION OF THIS PROJECT TO REMOVE ALL LAYERS OF EXISTING PAINT DUE TO THE HISTORIC NATURE OF THE EXISTING MATERIAL FABRIC.



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PROJECT No.: 1836C
DATE: 30 JUNE 2021
REVISIONS:

DRAWN BY: TBC, MMH, MS

RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
TOWNSHIP OF PISCATAWAY
MIDDLESEX COUNTY, NEW JERSEY

BID ALTERNATE No. 1

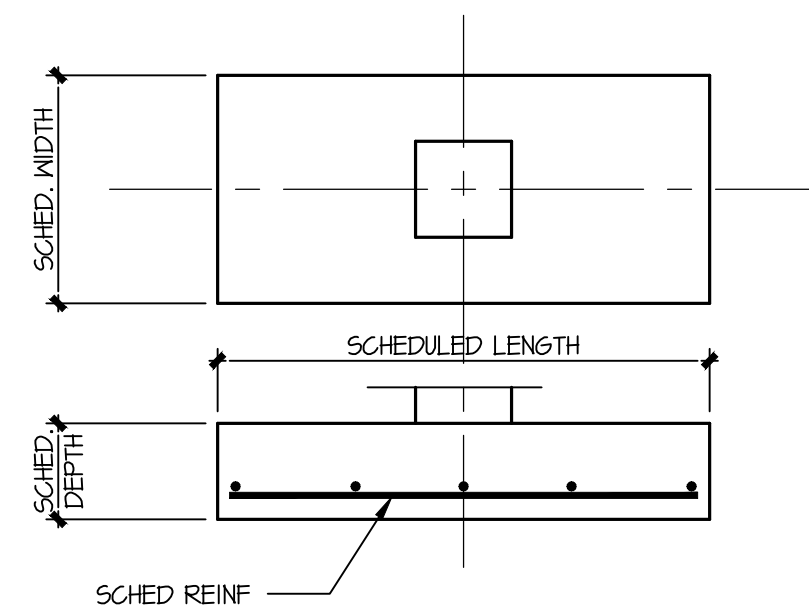
A25

COLUMN SCHEDULE

| | |
|-----|---|
| C-1 | H55 4x4x1/4 COLUMN SEE S2.1 FOR BASE PLATE |
|-----|---|

FOOTING SCHEDULE

| FOOTING MARK | DIMENSIONS | REINFORCING |
|--------------|---------------------|-----------------|
| (F3) | 3'-0" x 3'-0" x 12" | (3) #4 EACH WAY |

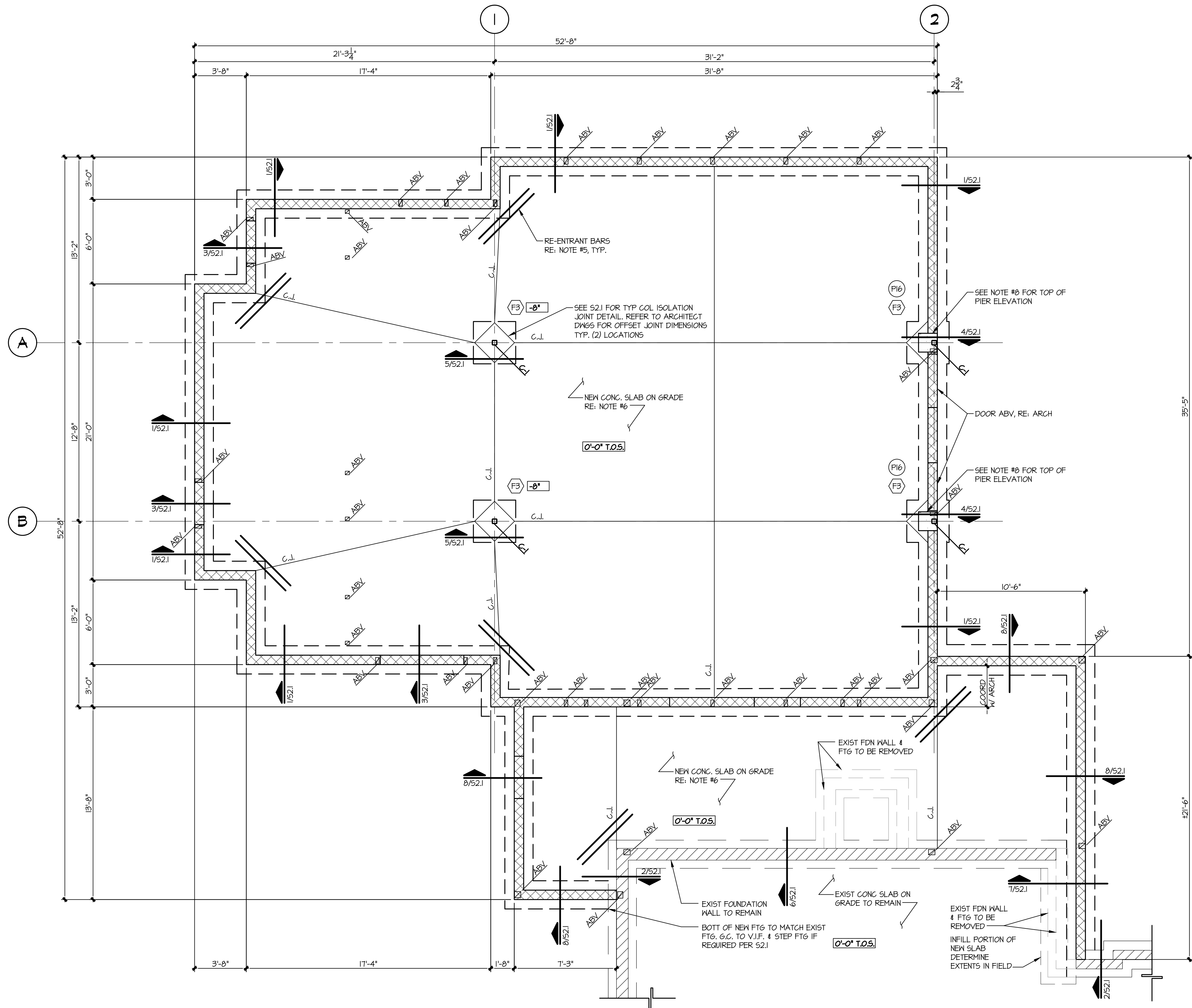


1 FOOTING SCHEDULE

PIER SCHEDULE

| PIER MARK | DIMENSIONS | REINFORCING |
|-----------|---------------------------|---|
| PI6 | 16" x 16" CONCRETE SQUARE | (6) #6 BARS w/ #3 TIES AT 4" O.C. w/ (4) #3 TIES AT TOP 12" |

2 PIER SCHEDULE



G.C. NOTE:
COORDINATE SITE GRADING WITH ARCHITECT. BOTT. OF FOOTING TO BE MIN 1'-0" INTO VIRGIN SOILS AND MIN 3'-0" BELOW GRADE FOR FROST PROTECTION, NOTIFY ARCHITECT/ENGINEER OF ANY UNSUITABLE SOILS.

FOUNDATION PLAN

SCALE 1/4" = 1'-0"

NOTES:

- THE CONTRACTOR SHALL VERIFY ALL EXISTING BUILDING INFORMATION SHOWN (DIMENSIONS, ELEVATIONS, ETC) AND NOTIFY THE ARCHITECT/ENGINEER OF ANY DISCREPANCIES PRIOR TO FABRICATION OF ANY STRUCTURAL COMPONENT. FAILURE TO NOTIFY ARCHITECT/ENGINEER OF UNSATISFACTORY CONDITIONS CONSTITUTES ACCEPTANCE OF UNSATISFACTORY CONDITIONS.
- G.C. IS RESPONSIBLE TO FIELD VERIFY EXIST DIMENSIONS AND MEMBER SIZE. CONTACT ENGINEER IMMEDIATELY WITH ANY SIGNIFICANT DIFFERENCES TYPICAL AT ALL FLOORS.
- PROVIDE TEMPORARY SHORING WHERE REQ'D TO MAINTAIN STABILITY.
- TOP OF SLAB IS SET AS THE BUILDING'S DATUM 0'-0".
- PROVIDE (2) #5 x 4'-0" LONG REINFORCING BARS AT ALL RE-ENTRANT SLAB CORNERS.
- SLAB ON GRADE SHALL BE 4" NORMAL WEIGHT CONCRETE (FC = 4,000 psi AT 28 DAYS) PLACED OVER A VAPOR BARRIER ON 4" OF CRUSHED STONE. REINFORCE WITH 6x6-IN. 4W4 W/F.
- FOOTINGS SHALL BEAR ON VIRGIN SOIL OR CONTROLLED COMPACTED FILL HAVING A MINIMUM BEARING CAPACITY OF 2,000 POUNDS PER SQUARE FOOT. TOP OF FOOTING ELEVATIONS ARE SHOWN THIS [X] ON PLAN AND ARE REFERENCED TO THE BUILDING'S DATUM.
- TOP OF PIERS ARE LEVEL WITH TOP OF SLAB.
- [X] INDICATES FOOTING TYPE, SEE FOOTING SCHEDULE FOR SIZE AND REINFORCING.
- [F3] INDICATES PIER TYPE, SEE SCHEDULE FOR SIZE AND REINFORCING.
- ALL COLUMN FOOTINGS SHALL BE CENTERED UNDER COLUMN CENTERLINES UNLESS NOTED OTHERWISE ON PLAN.
- FOR GENERAL NOTES SEE DRAWING S01.
- F.S. - DENOTES FOOTING STEP. SEE DETAIL SHEETS.
- C.J. DENOTES CONTROL JOINT. RE: TYPICAL DETAILS FOR CONSTRUCTION.
- AT ALL LOCATIONS WHERE PLUMBING LINES EXIT THE BUILDING, DEEPEN FOOTINGS AS REQUIRED TO ALLOW 6" (MIN) CLEARANCE BETWEEN PIPE AND FOOTING.



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24GA28128300

NEW JERSEY PROFESSIONAL ENGINEER
LICENSE NUMBER: GE 41789

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PROJECT TITLE:

RESTORATION AND EXPANSION OF
HISTORIC METLAR -BODINE HOUSE

1281 RIVER ROAD
PISCATAWAY, NJ

DATE: REVISION:

DRAWING TITLE:

DESIGNED BY: KCS

DRAWN BY: RBP

DATE: 06/17/21

SCALE: AS NOTED

PROJECT #: 1982MT_01

DRAWING NUMBER:

S1.1

ISSUED FOR BID 06/17/21

COLUMN SCHEDULE

| | |
|-----|--------------------|
| C-1 | H65 4x4x1/4 COLUMN |
|-----|--------------------|

HEADER SCHEDULE

| | |
|-----|------------|
| H-2 | (2) 2x10'S |
| H-5 | (3) 2x10'S |

POST SCHEDULE

| | |
|-----|----------------------|
| P-1 | (2) 2x4'S |
| P-2 | (2) 2x6'S |
| P-4 | (3) 2x6'S |
| P-8 | 3-1/2x5-1/4 PSL POST |
| P-4 | 5-1/4x5-1/4 PSL POST |

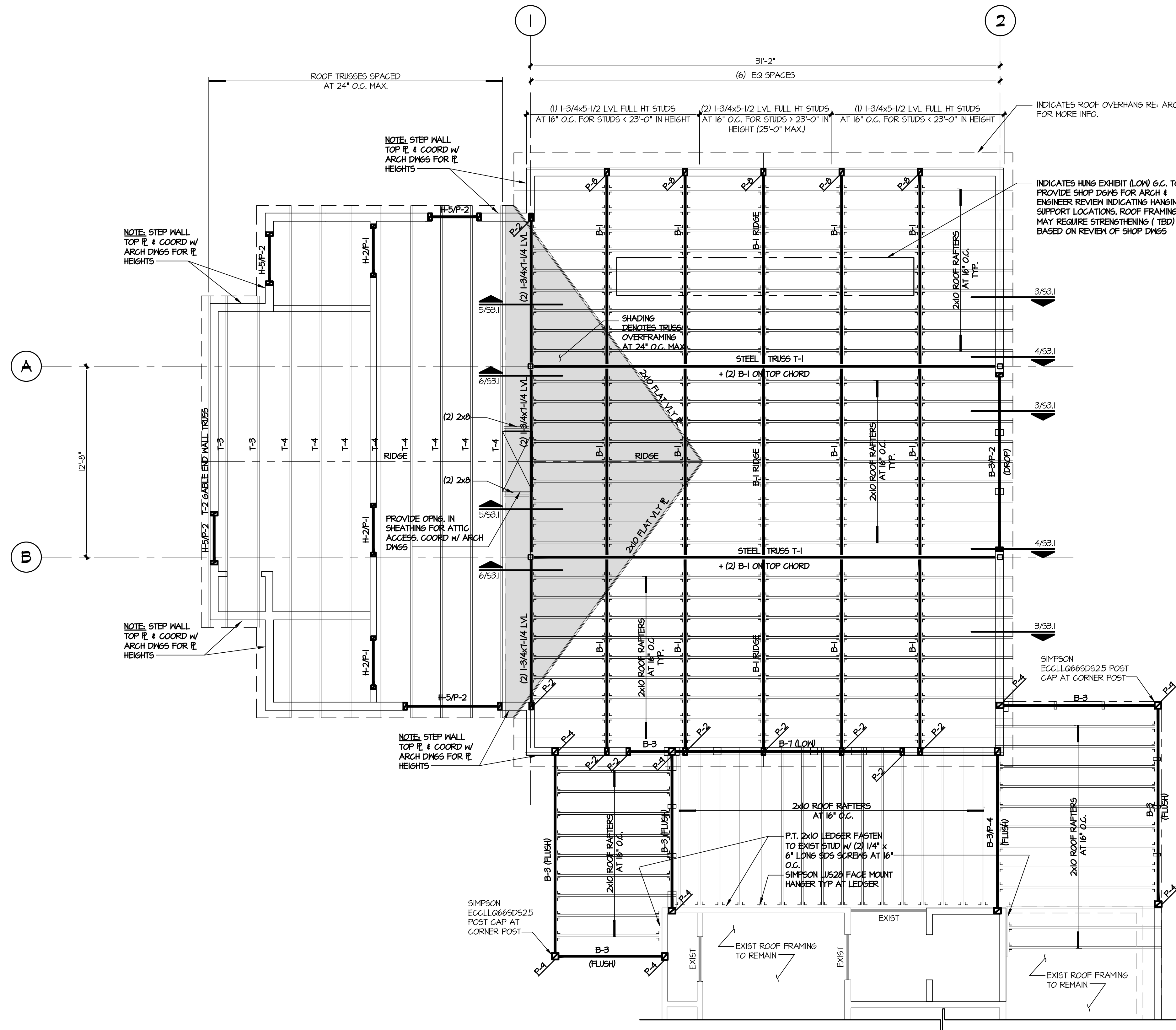
BEAM SCHEDULE

| | |
|-----|------------------|
| B-1 | 1-3/4x9-1/4 LVL |
| B-3 | 5-1/4x9-1/2 PSL |
| B-7 | 5-1/4x11-7/8 PSL |

WOOD TRUSS LOADING

| | |
|--------------|--------|
| TCLL | 25 PSF |
| TCDL | 15 PSF |
| BCLL | 10 PSF |
| BCLL (ATTIC) | 50 PSF |
| BCDL | 10 PSF |

- NOTES:
 1. SEE STRUCTURAL NOTES FOR REQUIRED WOOD SPECIES AND GRADE.
 2. PROVIDE 1/2" PLYWOOD SHIM BETWEEN EACH PLY. MATCH DEPTH OF HEADER.
 3. FOR 2x8 MULTIPLE MEMBERS GLUE AND NAIL EACH PLY W/ (3) ROWS OF 16d NAILS AT 8" O.C.
 4. FOR 2x10 AND 2x12 MULTIPLE MEMBERS GLUE AND NAIL EACH PLY W/ (4) ROWS OF 16d NAILS AT 8" O.C.
 5. NAIL OR BOLT MULTIPLE LVL BEAMS AND HEADERS PER MANUFACTURERS REQUIREMENTS.
 6. PRE-ENGINEERED WOOD HEADERS MAY BE SUBSTITUTED FOR THE 2x WOOD HEADERS SHOWN ON THE DRAWINGS. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR APPROVAL PRIOR TO CONSTRUCTION.



ROOF FRAMING PLAN
 SCALE: 1/4" = 1'-0"

- NOTES:
 I. THE CONTRACTOR SHALL VERIFY ALL EXISTING BUILDING INFORMATION SHOWN (DIMENSIONS, ELEVATIONS, ETC) AND NOTIFY THE ARCHITECT/ENGINEER OF ANY DISCREPANCIES PRIOR TO FABRICATION OF ANY STRUCTURAL COMPONENT. FAILURE TO NOTIFY ARCHITECT/ENGINEER OF UNSATISFACTORY CONDITIONS CONSTITUTES ACCEPTANCE OF UNSATISFACTORY CONDITIONS.
 2. G.C. IS RESPONSIBLE TO FIELD VERIFY EXIST DIMENSIONS AND MEMBER SIZE. CONTACT ENGINEER IMMEDIATELY WITH ANY SIGNIFICANT DIFFERENCES TYPICAL AT ALL FLOORS.
 3. PROVIDE TEMPORARY SHORING WHERE REQ'D TO MAINTAIN STABILITY.
 4. TYPICAL ROOF CONSTRUCTION 3/4" PLYWOOD SHEATHING ON WOOD FRAMED STRUCTURE.
 5. ALL HEADERS TO BE DROPPED UNLESS NOTED OTHERWISE.
 6. ALL 2x STRUCTURAL FRAMING TO BE #2 DOUG FIR OR BETTER.
 7. ALL HEADERS TO BE MIN. (2) 2x10'S IN 2x4 EXTERIOR WALL AND (3)2x10'S IN 2x6 EXTERIOR WALL UNLESS NOTED OTHERWISE ON PLAN.
 8. ALL OPENINGS IN THE EXTERIOR WALL 6'-0" AND GREATER SHALL HAVE A DOUBLE JACK STUD AND KING STUD.
 9. REFER TO ARCH SECTIONS AND ELEVATIONS FOR PLATE HEIGHTS.
 10. FOR GENERAL NOTES SEE DRAWING 501.
 II. GENERAL CONTRACTOR IS RESPONSIBLE TO INSTALL ALL PROPRIETARY FRAMING IN ACCORDANCE WITH ALL MANUFACTURERS REQUIREMENTS. TYPICAL FOR ALL ROOF FRAMING THAT IS PRE-ENGINEERED LUMBER OR ROOF TRUSS CONSTRUCTION.
 12. INSTALL PROPER HANGERS AT ALL ROOF RAFTERS. THE INSTALLATION OF THE HANGERS SHALL COMPLY WITH THE MANUFACTURERS RECOMMENDED DETAILS.
 13. H-XP-X DENOTES HEADER/BEAM AND END POST DESIGNATION. RE: SCHEDULE FOR SIZE, POSTS SIZES INDICATED ON PLAN AT POST LOCATIONS ARE SPECIFIC TO HEADER/BEAM END ONLY. TRUSS MANUFACTURER TO PROVIDE AND DETAIL ALL TEMPORARY AND PERMANENT ROOF TRUSS BRACING.



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PROJECT TITLE:

RESTORATION AND EXPANSION OF
HISTORIC METLAR -BODINE HOUSE
 1281 RIVER ROAD
 PISCATAWAY, NJ

DATE: REVISION:

DRAWING TITLE:

ROOF FRAMING PLAN

DESIGNED BY: KCS

DRAWN BY: RBP

DATE: 06/17/21

SCALE: AS NOTED

PROJECT #: 1982MT 01

DRAWING NUMBER:

S1.2

ISSUED FOR BID 06/17/21



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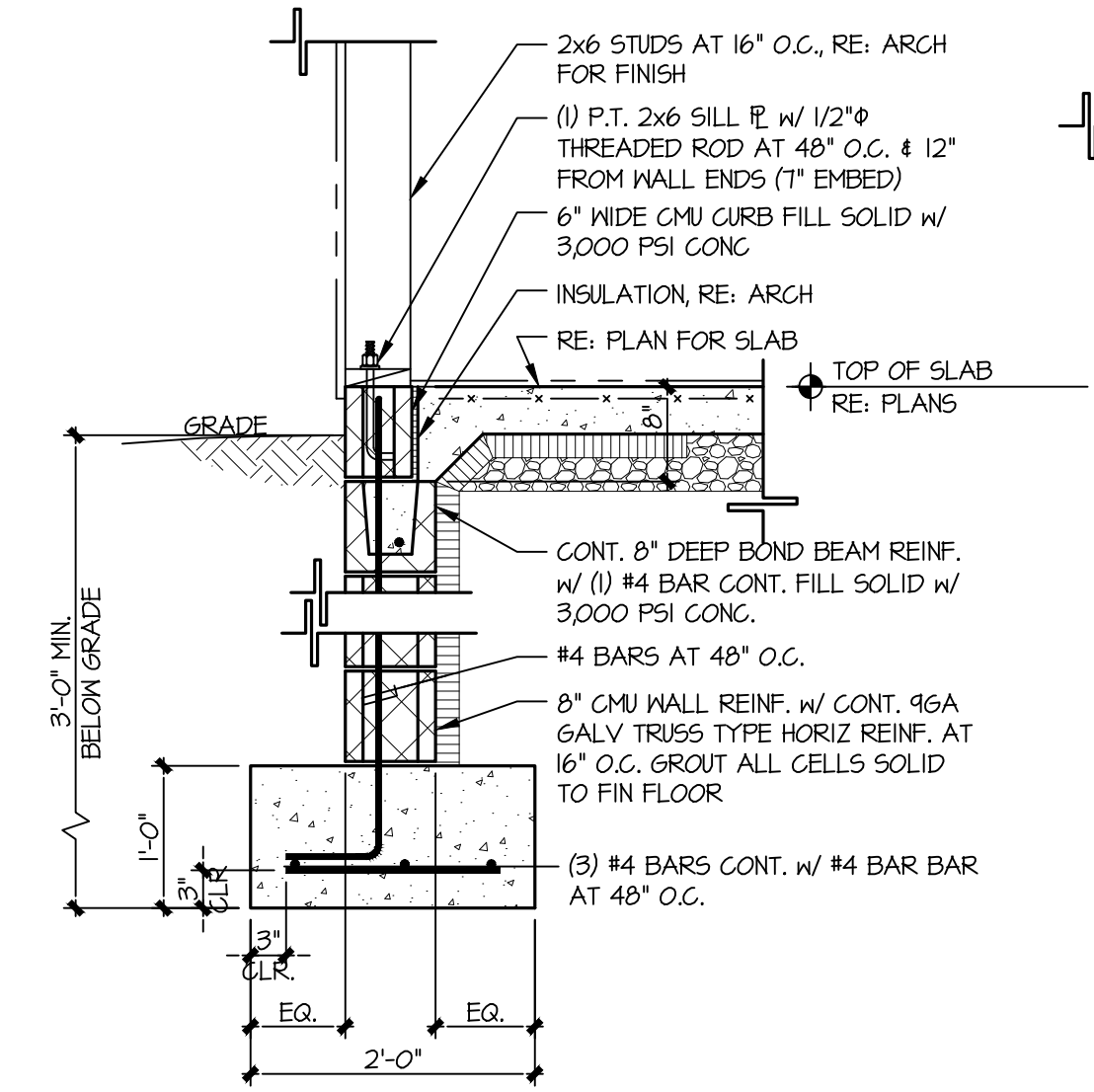
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PROJECT TITLE:

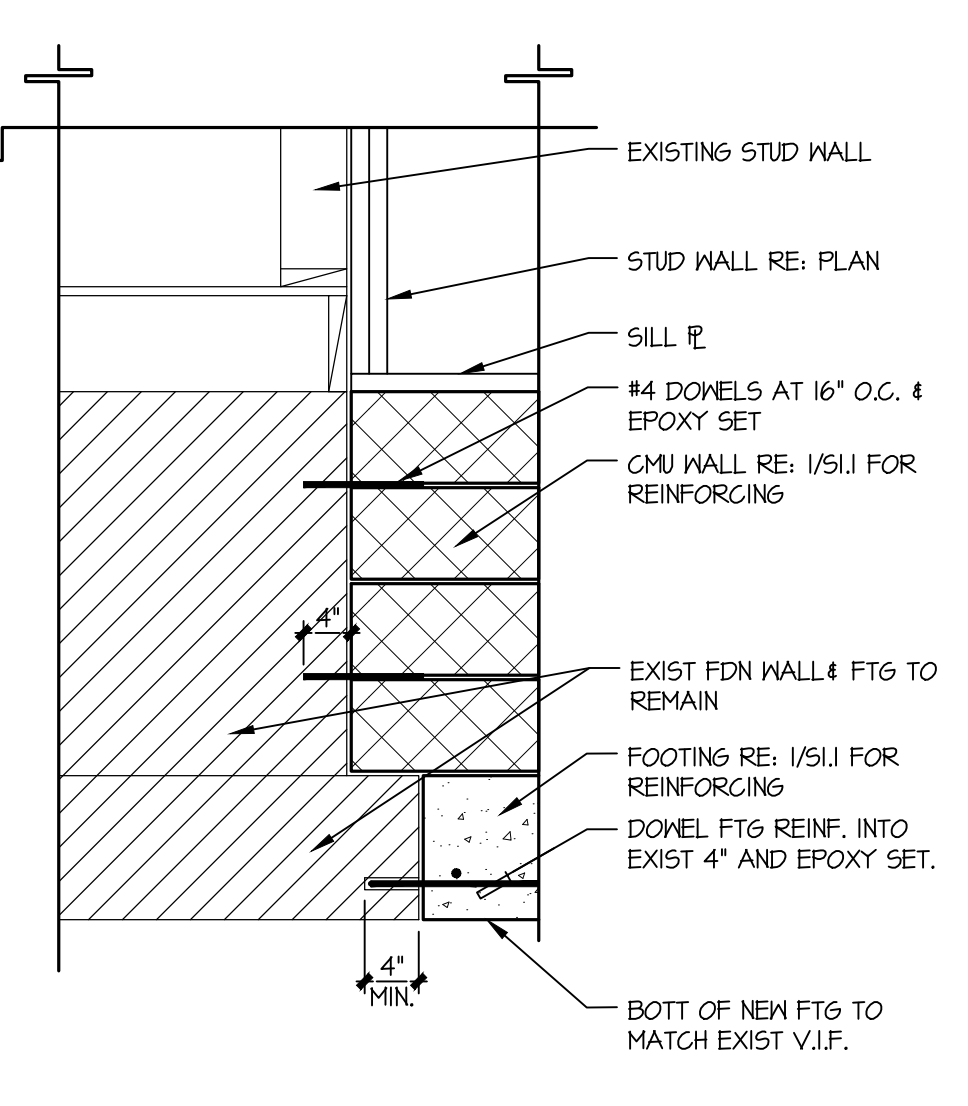
RESTORATION AND EXPANSION OF
HISTORIC METLAR - BODINE HOUSE

1281 RIVER ROAD
PISCATAWAY, NJ

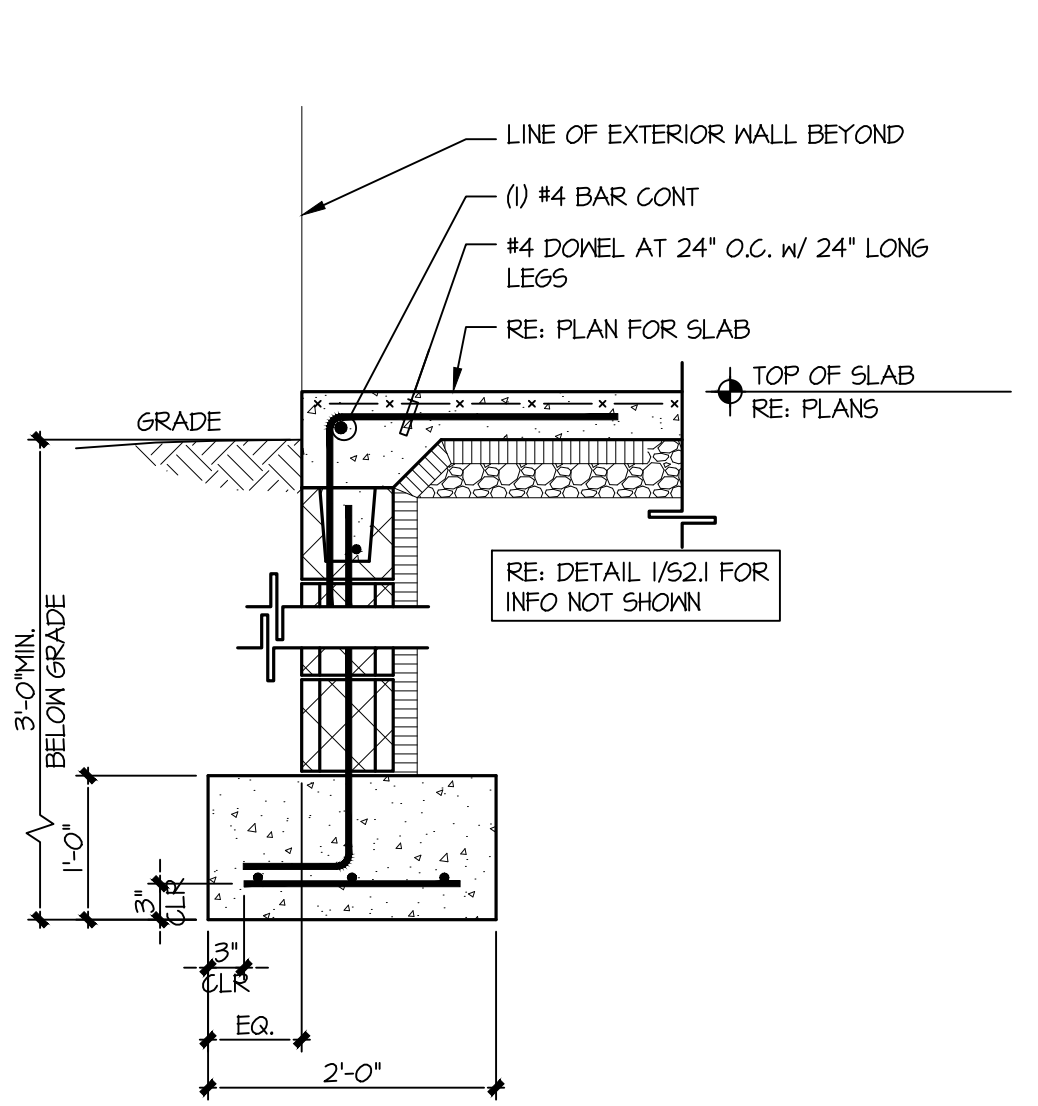
RESTORATION AND EXPANSION OF
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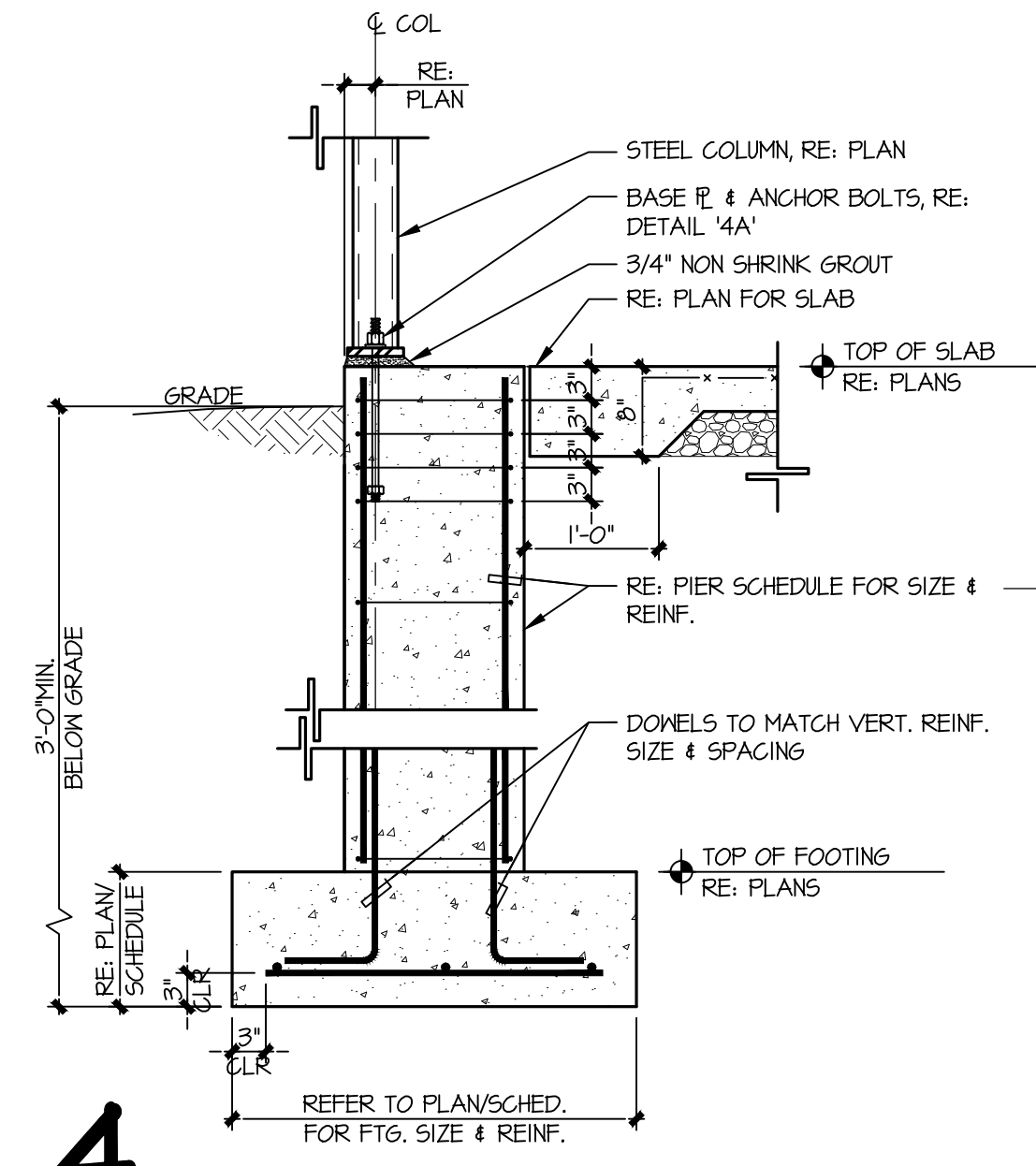
1 DETAIL AT EXTERIOR WALL
SCALE: 3/4" = 1'-0"



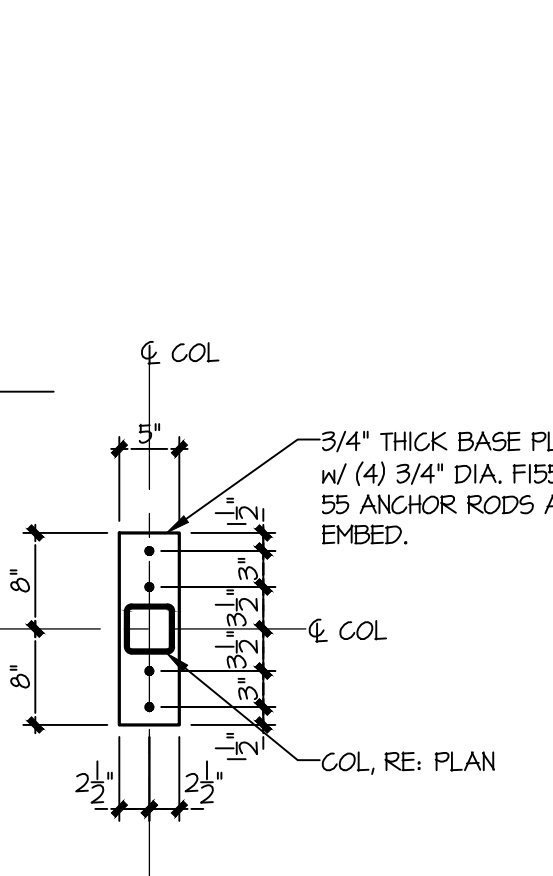
2 DETAIL AT NEW TO EXIST FDN
SCALE: 3/4" = 1'-0"



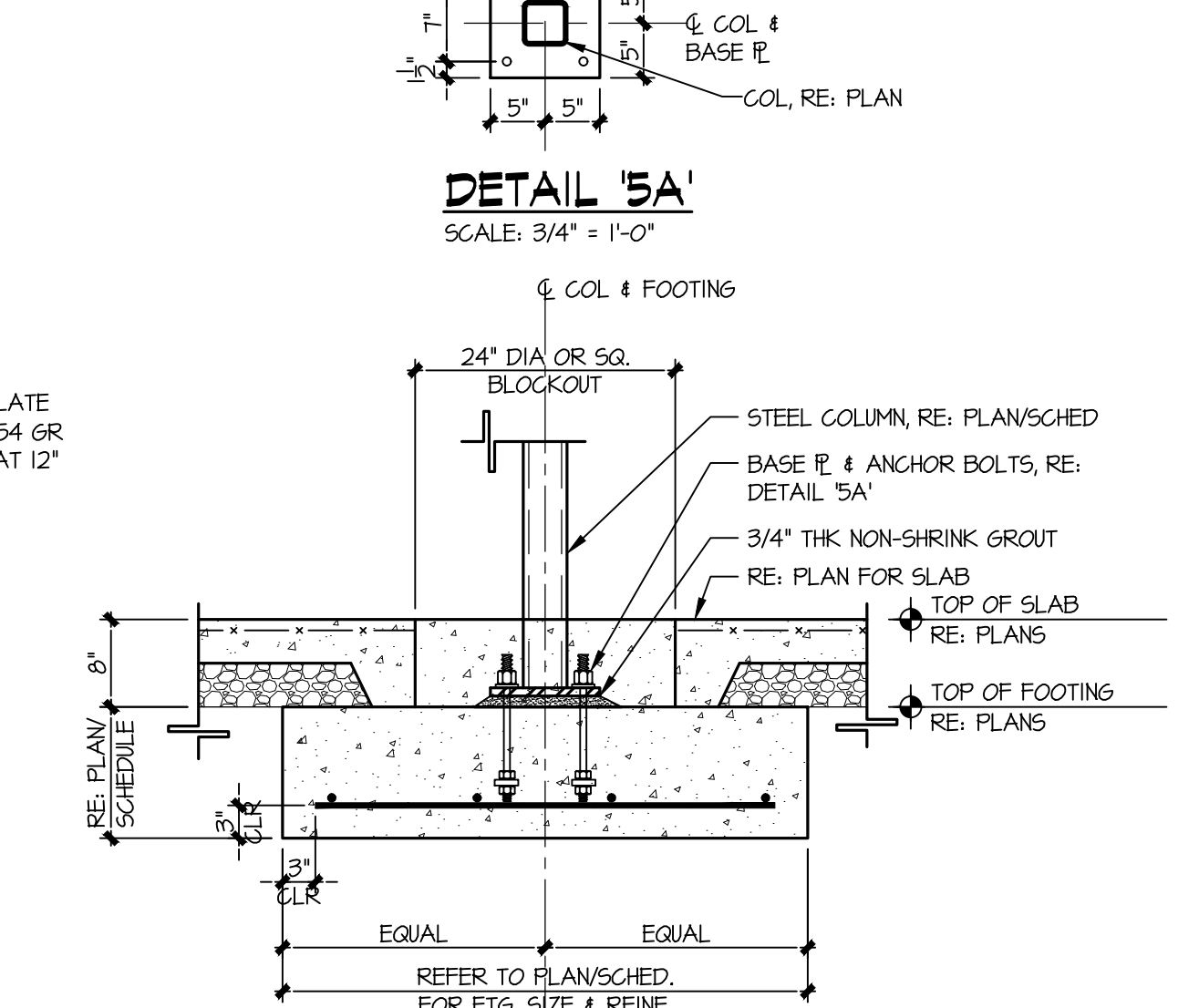
3 DETAIL AT DOOR/STOREFRONT ABOVE
SCALE: 3/4" = 1'-0"



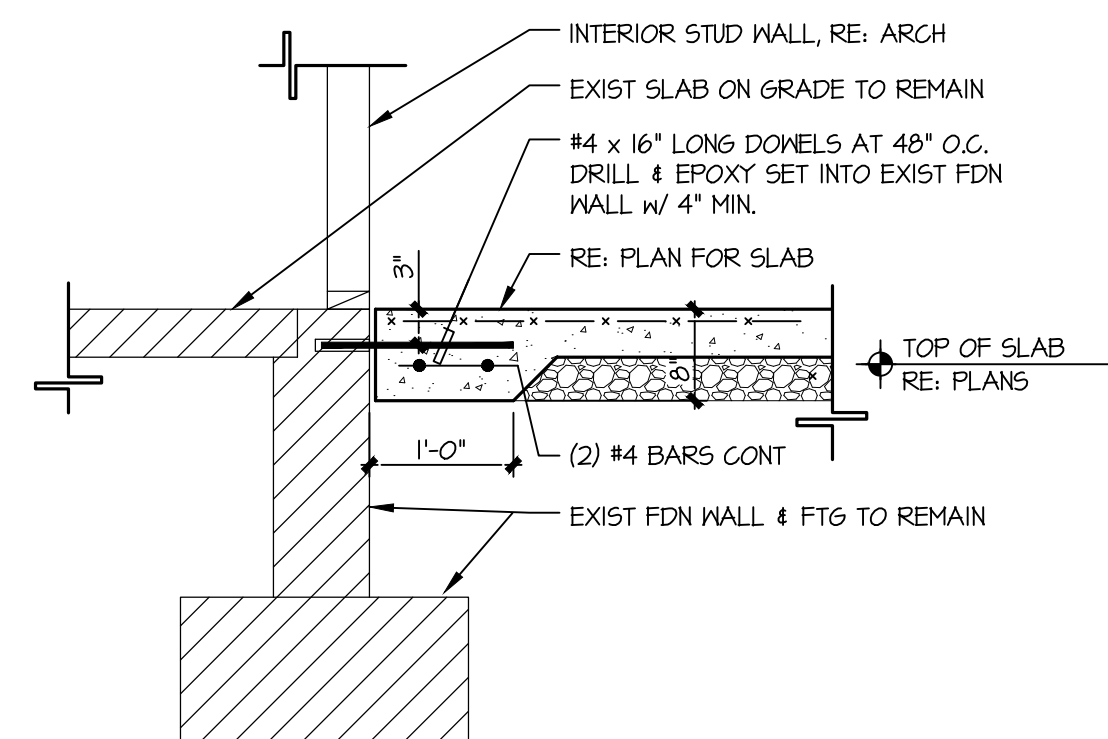
4 DETAIL AT EXTERIOR STEEL COLUMN
SCALE: 3/4" = 1'-0"



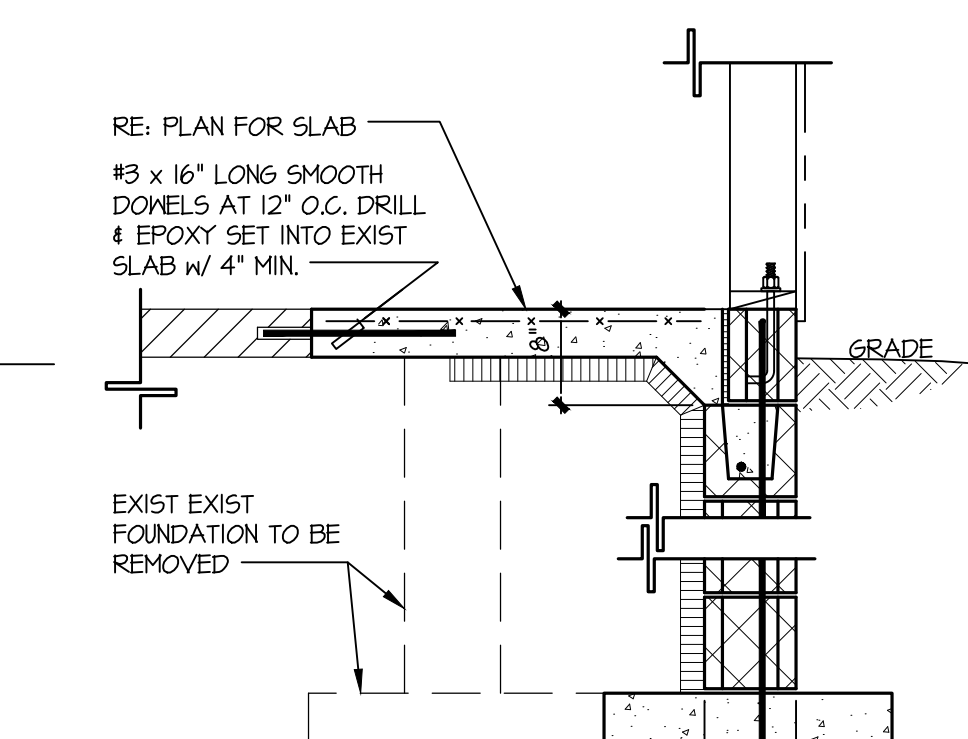
DETAIL '4A'
SCALE: 3/4" = 1'-0"



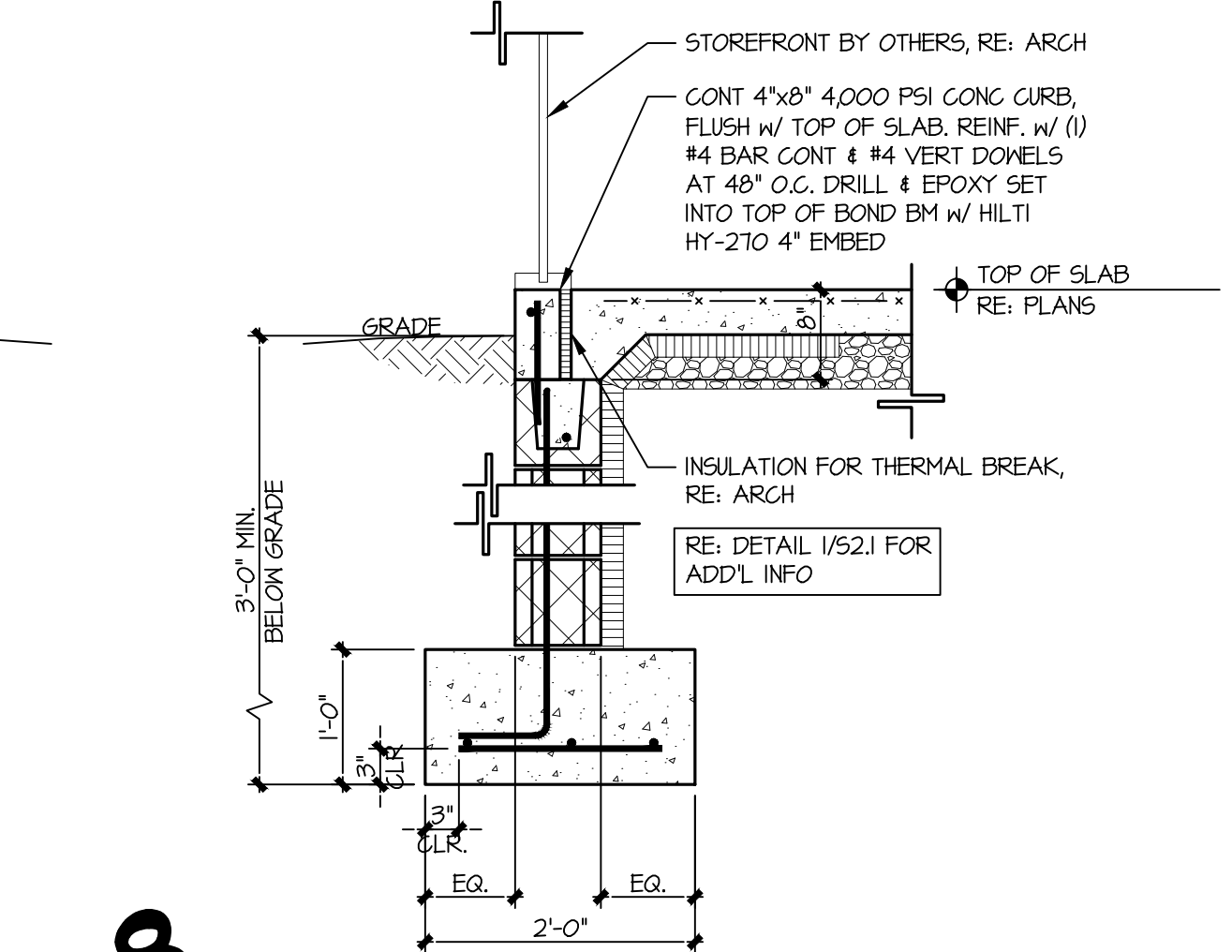
5 DETAIL AT INTERIOR COLUMN FOOTING
SCALE: 3/4" = 1'-0"



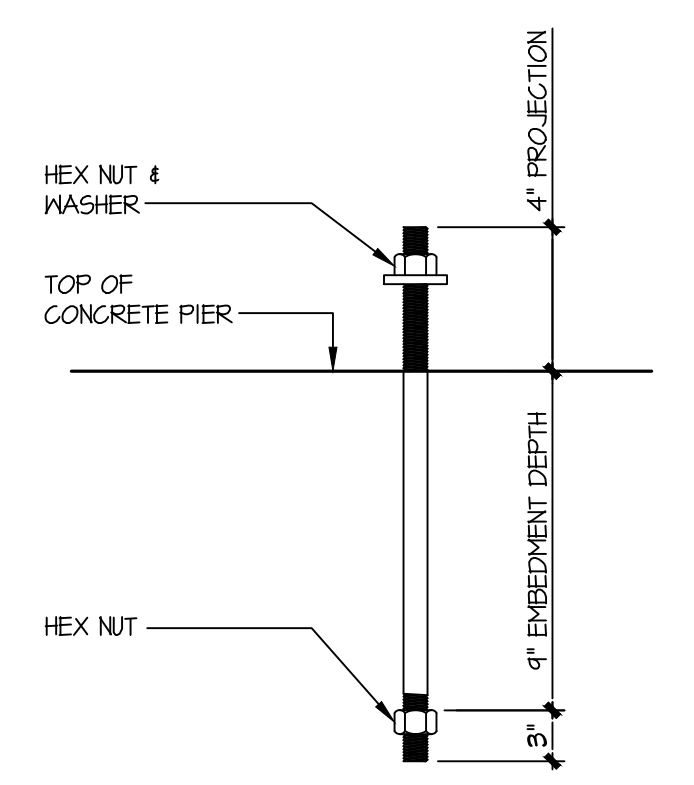
6 DETAIL AT NEW TO EXIST SLAB
SCALE: 3/4" = 1'-0"



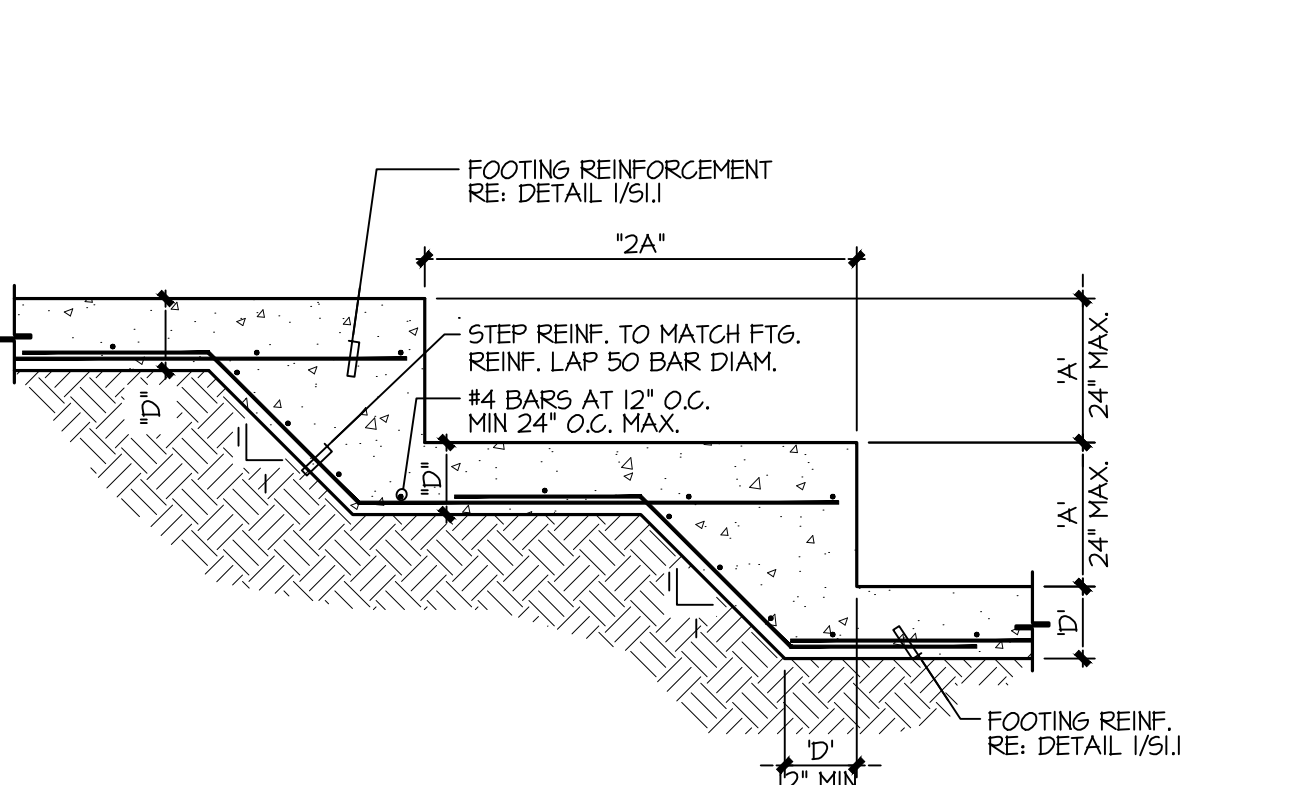
7 DETAIL AT FOUNDATION WALL SHIFT
SCALE: 3/4" = 1'-0"



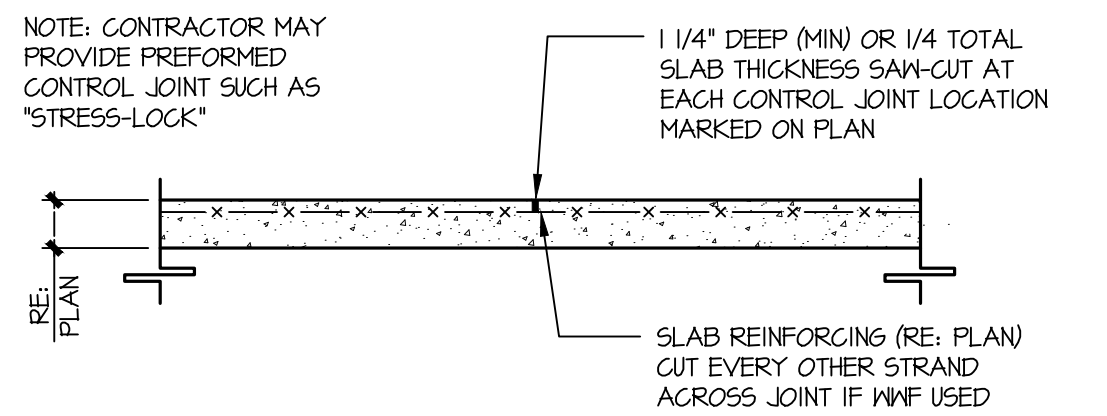
8 DETAIL AT STOREFRONT
SCALE: 3/4" = 1'-0"



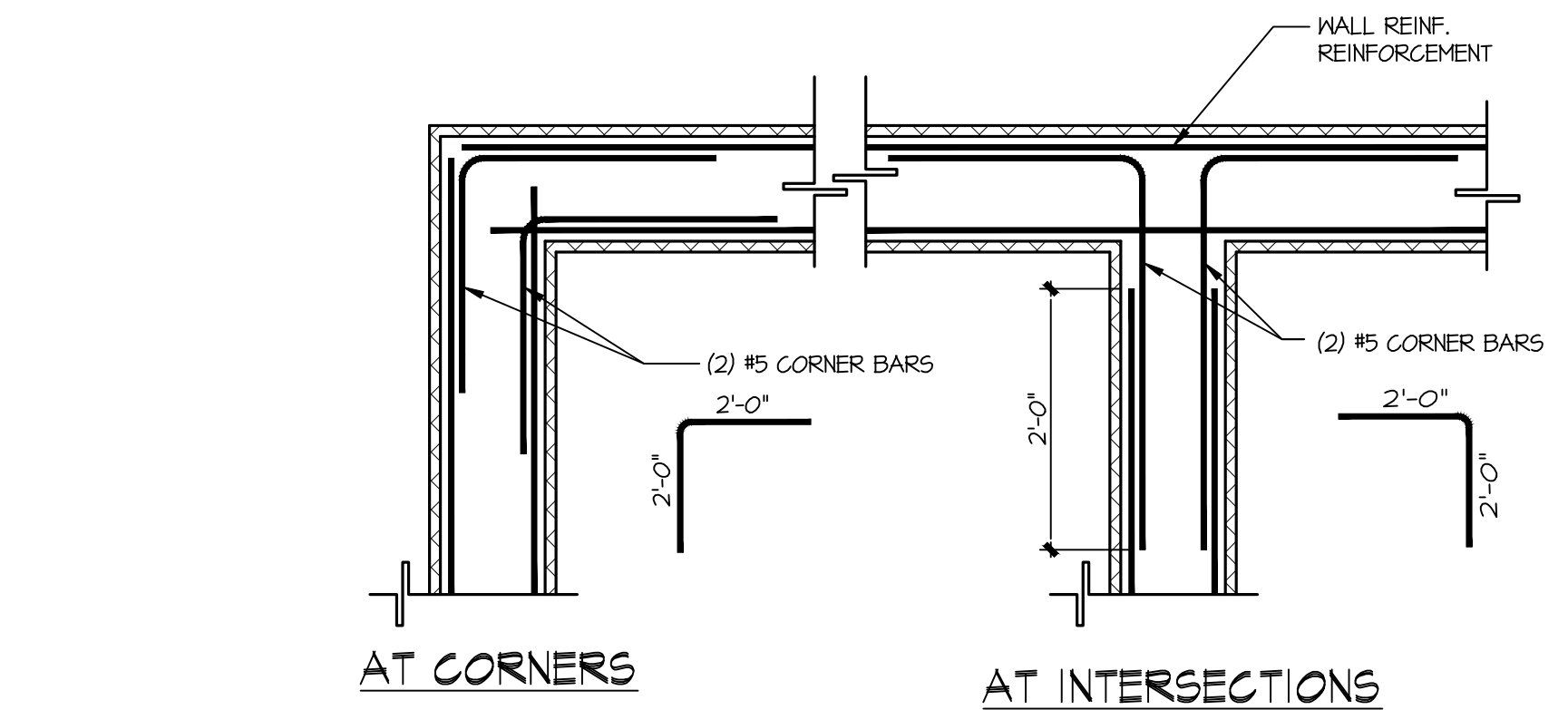
ANCHOR ROD DETAIL



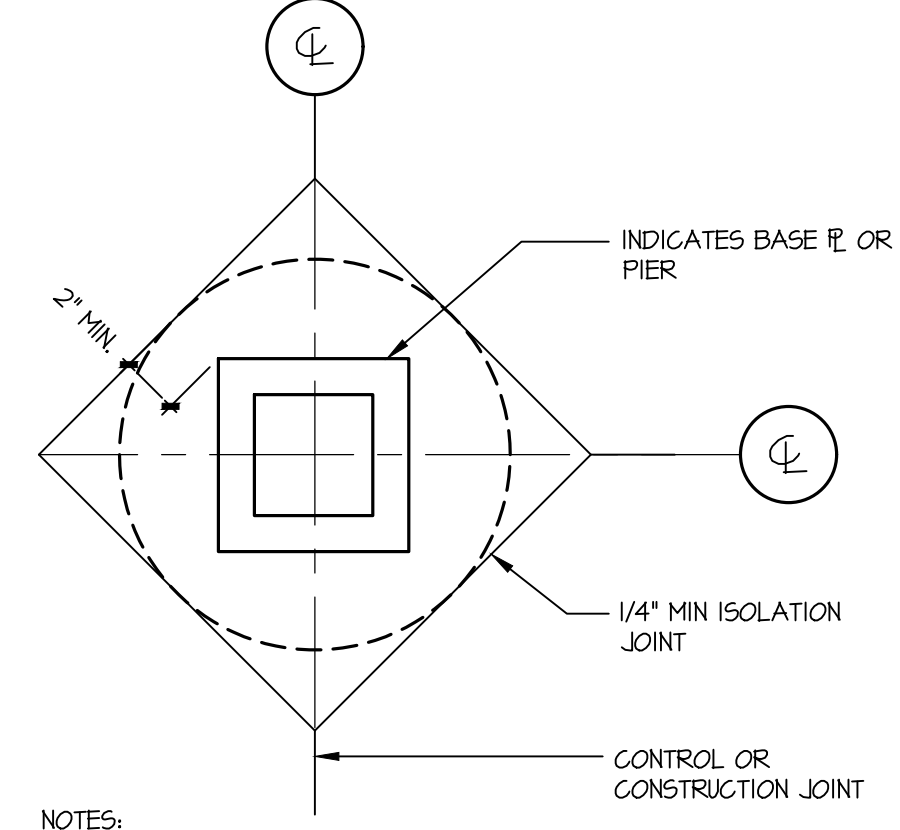
TYPICAL FOOTING STEP



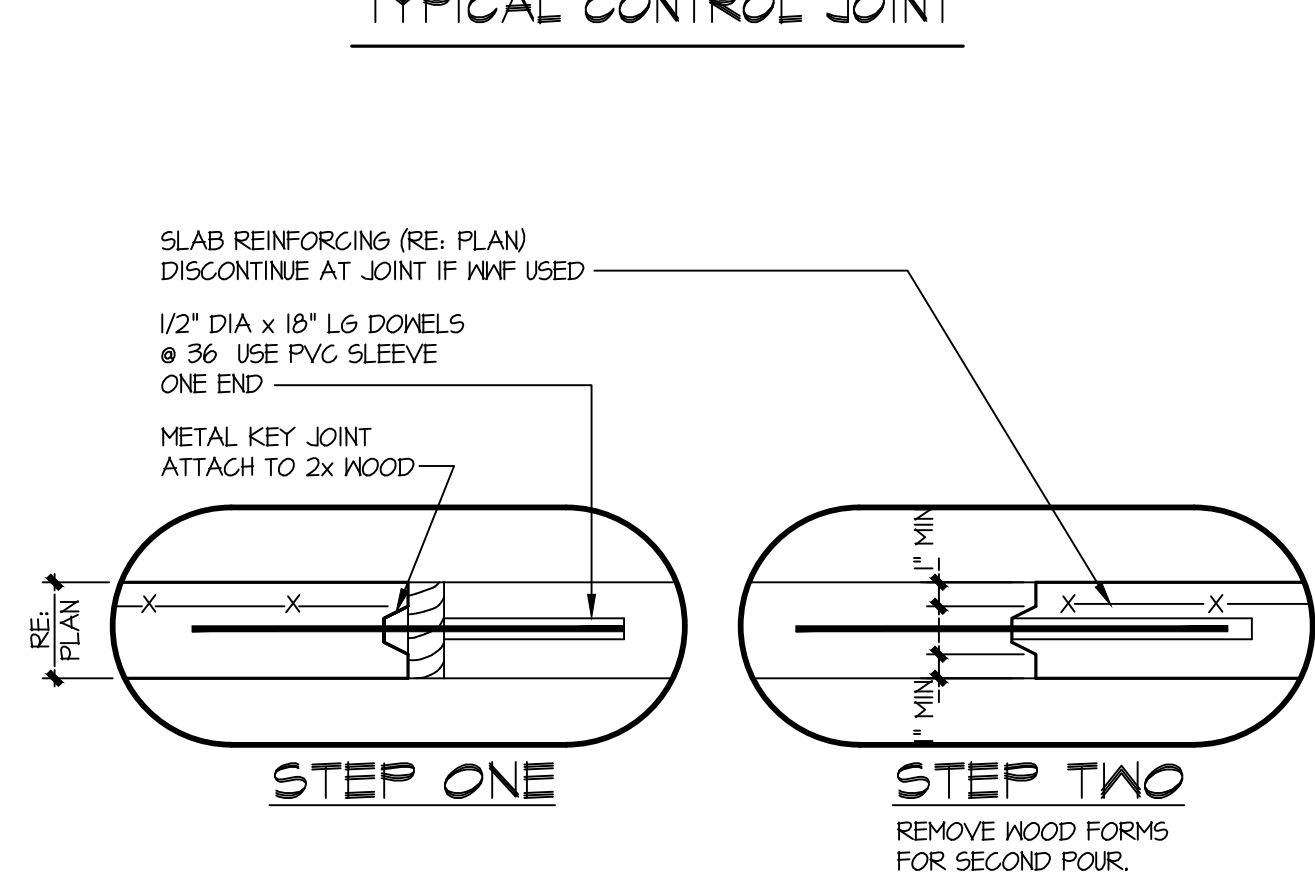
TYPICAL CONTROL JOINT



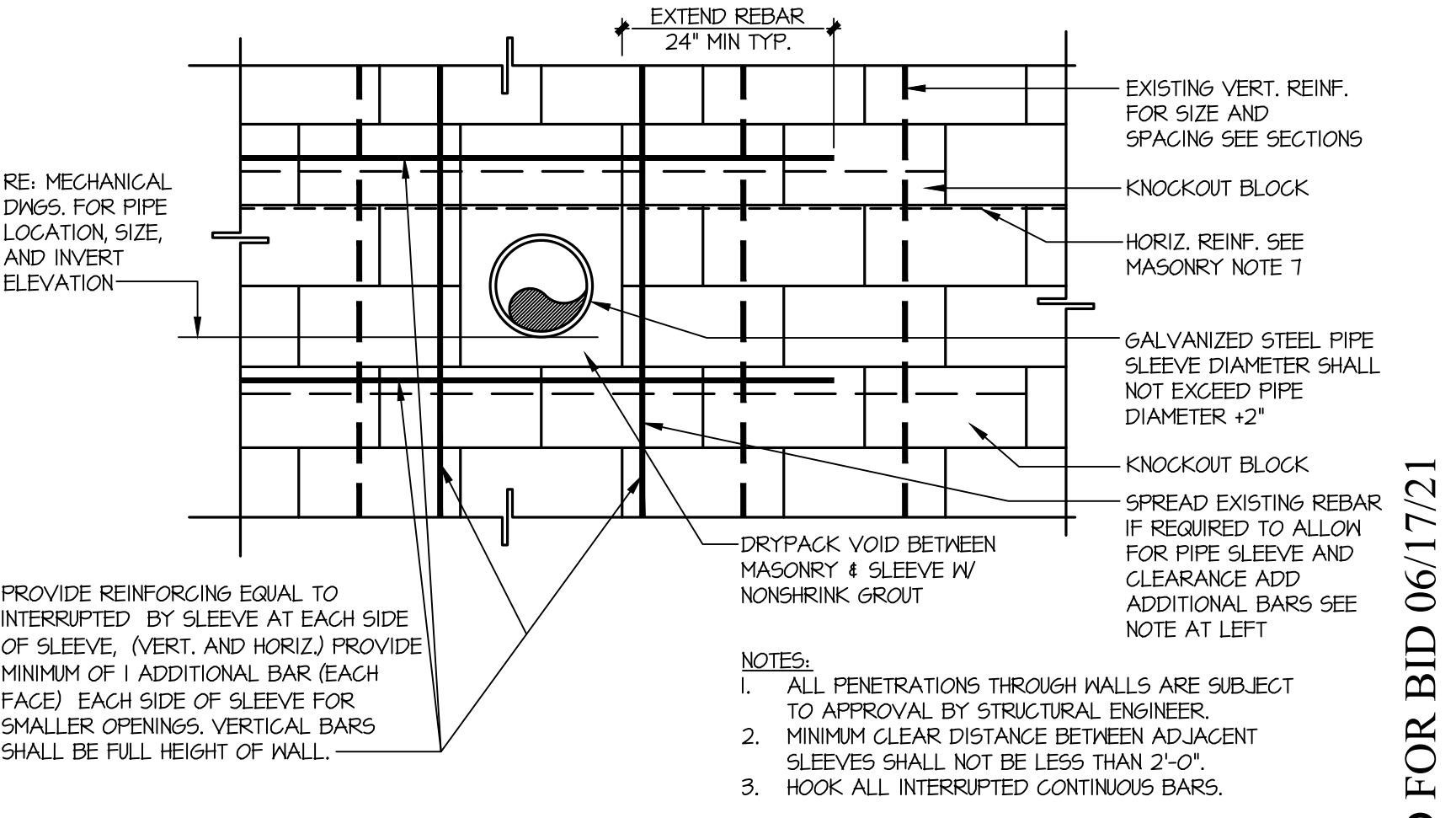
DETAIL AT HORIZ. REINF. IN BOND BEAMS



COLUMN ISOLATION JOINT DETAIL



TYPICAL CONSTRUCTION JOINT



TYPICAL PIPE PENETRATION THROUGH MASONRY FOUNDATION WALL

ISSUED FOR BID 06/17/21

DATE: REVISION:

DRAWING TITLE:
FOUNDATION & TYPICAL DETAILS

DESIGNED BY:
KCS

DRAWN BY:
RBP

DATE:
06/17/21

SCALE:
AS NOTED

PROJECT #:
1982MT 01

DRAWING NUMBER:
S2.1



PROFESSIONAL ENGINEERS

ADDRESS:

P.O. BOX 628 FARMINGDALE, NJ 07727

PHONE:

732.938.2666

FAX:

732.938.2661

CERTIFICATE OF AUTHORIZATION NO.

24GA28128300

KEVIN C. SOMMONS

NEW JERSEY PROFESSIONAL ENGINEER
LICENSE NUMBER: GE 41789

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CURRENT STATUTES.

PROJECT TITLE:

RESTORATION AND EXPANSION OF
HISTORIC METLAR - BODINE HOUSE

1281 RIVER ROAD
PISCATAWAY, NJ

DATE: REVISION:

DRAWING TITLE:
FRAMING
DETAILS & TRUSS
PROFILES

DESIGNED BY:

KCS

DRAWN BY:

RBP

DATE:

06/17/21

SCALE:

AS NOTED

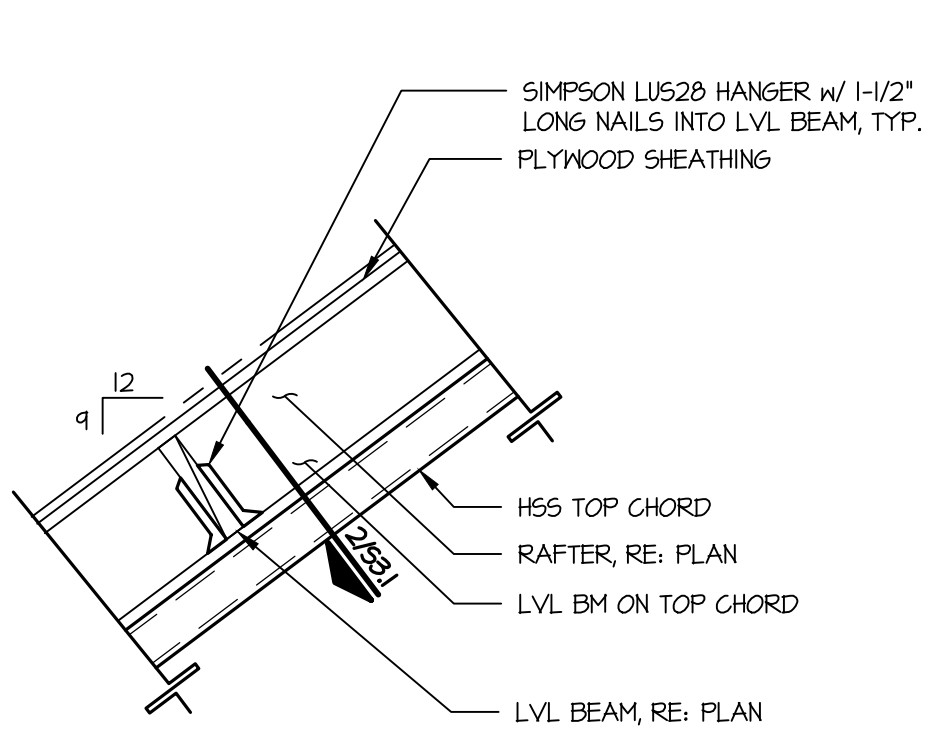
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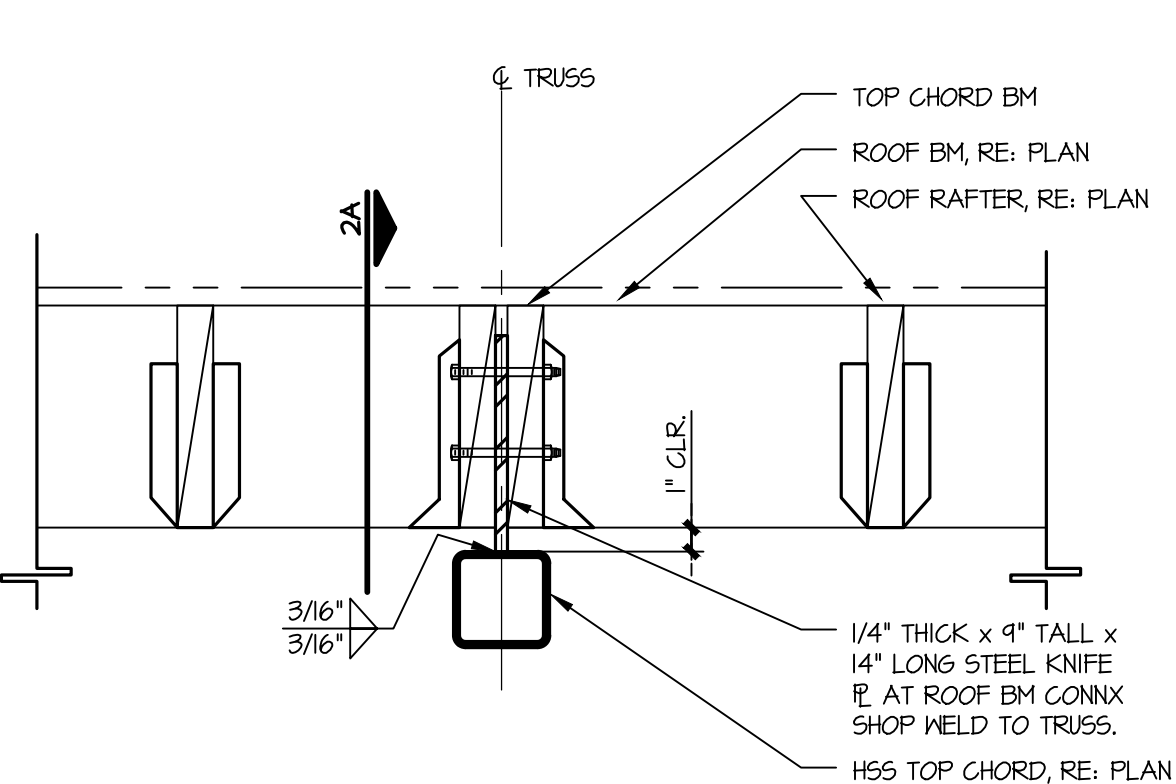
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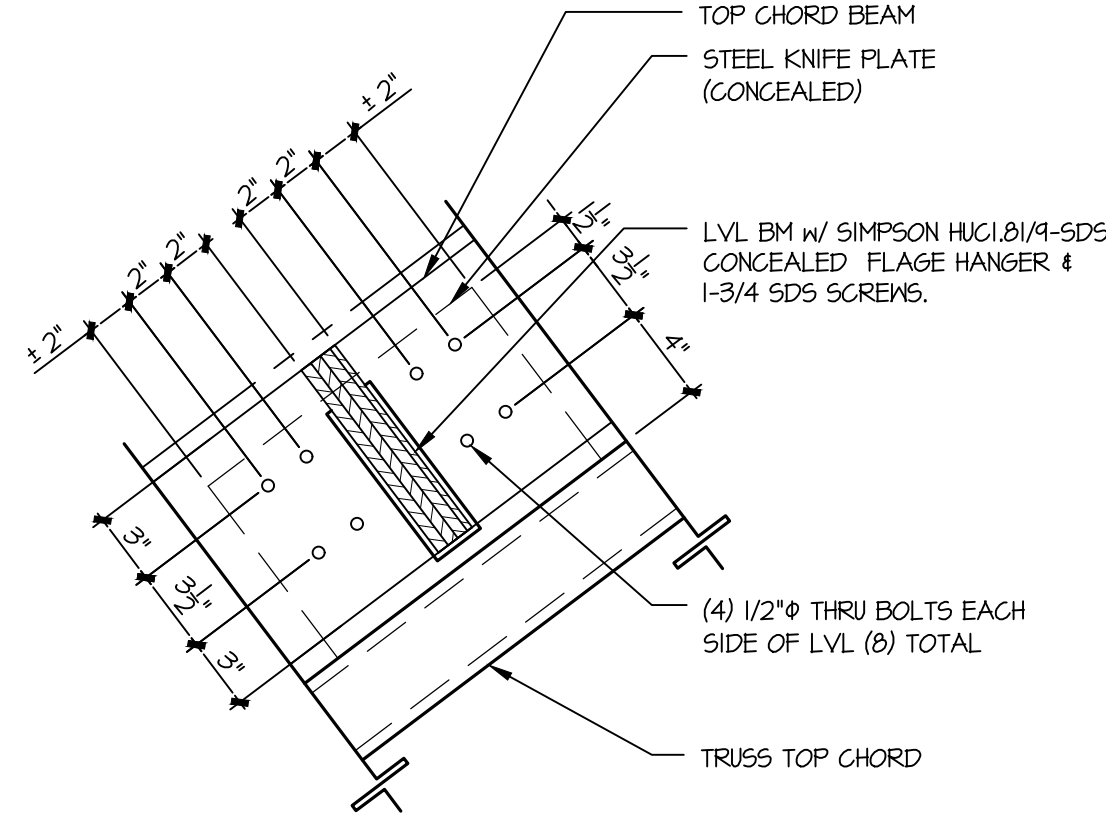
ISSUED FOR BID 06/17/21



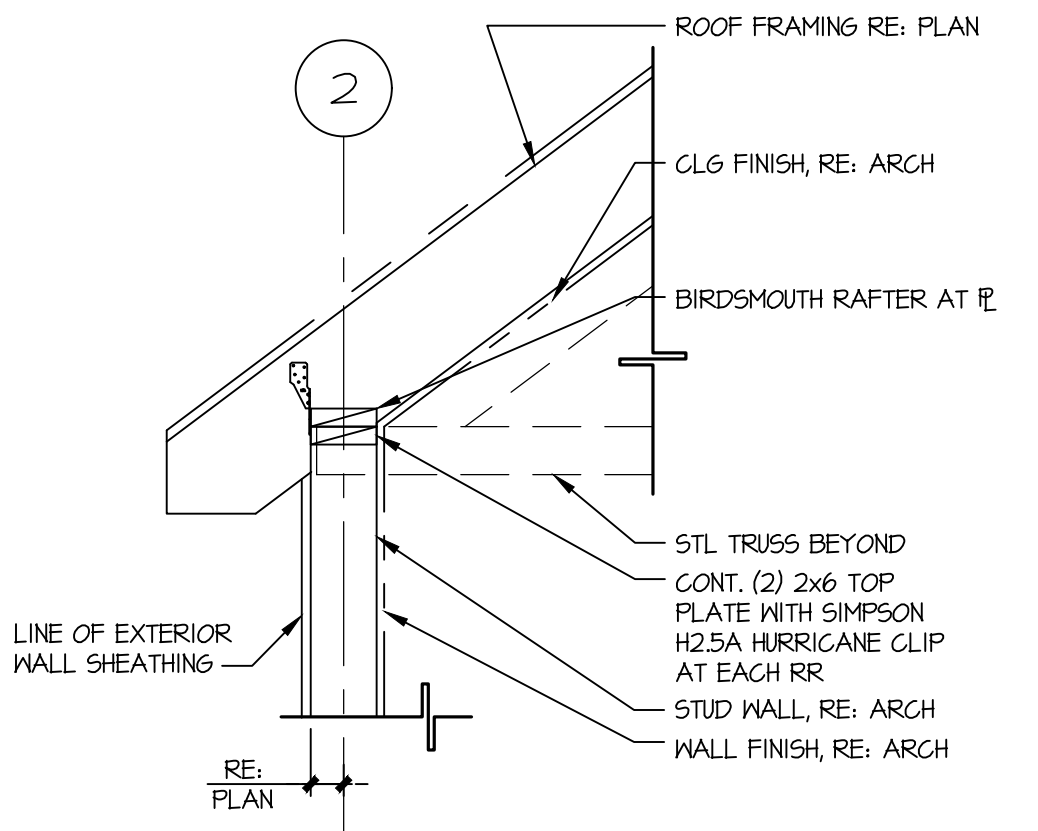
1 DETAIL AT TRUSS TOP CHORD
SCALE: 3/4" = 1'-0"



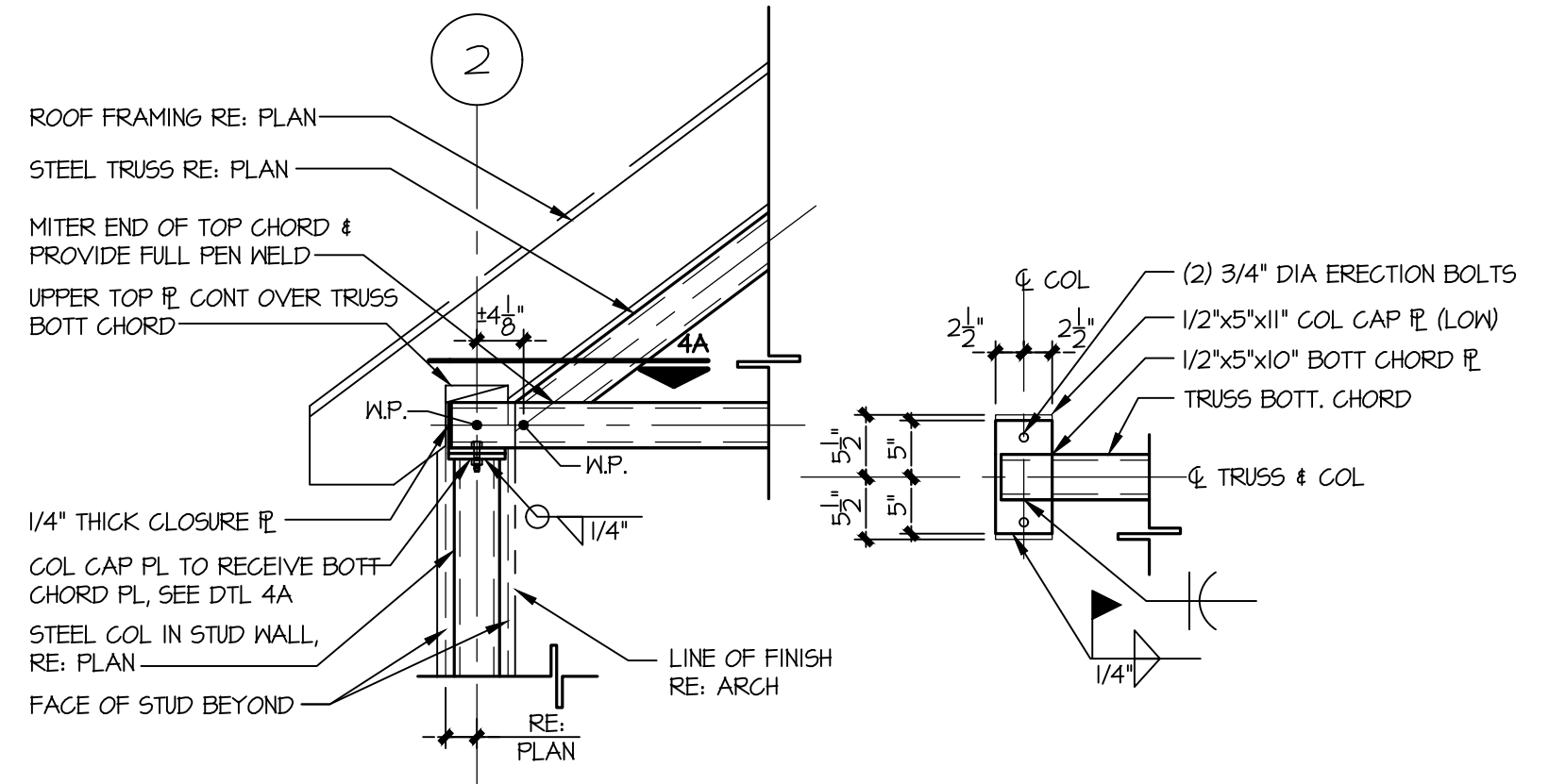
2 DETAIL AT ROOF BM TO TRUSS CONNX
SCALE: 1-1/2" = 1'-0"



2A DETAIL AT ROOF BM TO TRUSS CONNX
SCALE: 1-1/2" = 1'-0"

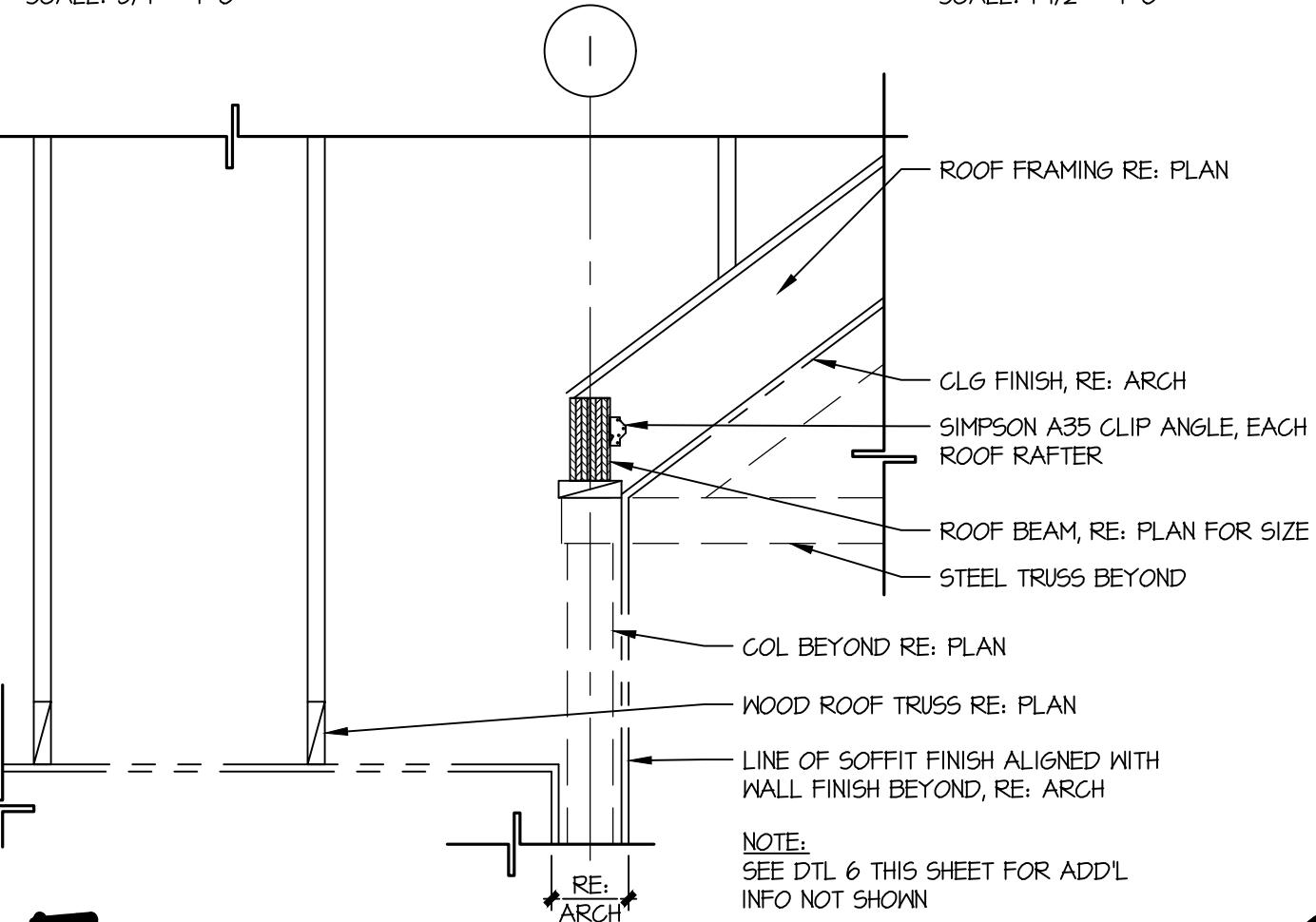


3 DETAIL AT ROOF EAVE
SCALE: 3/4" = 1'-0"

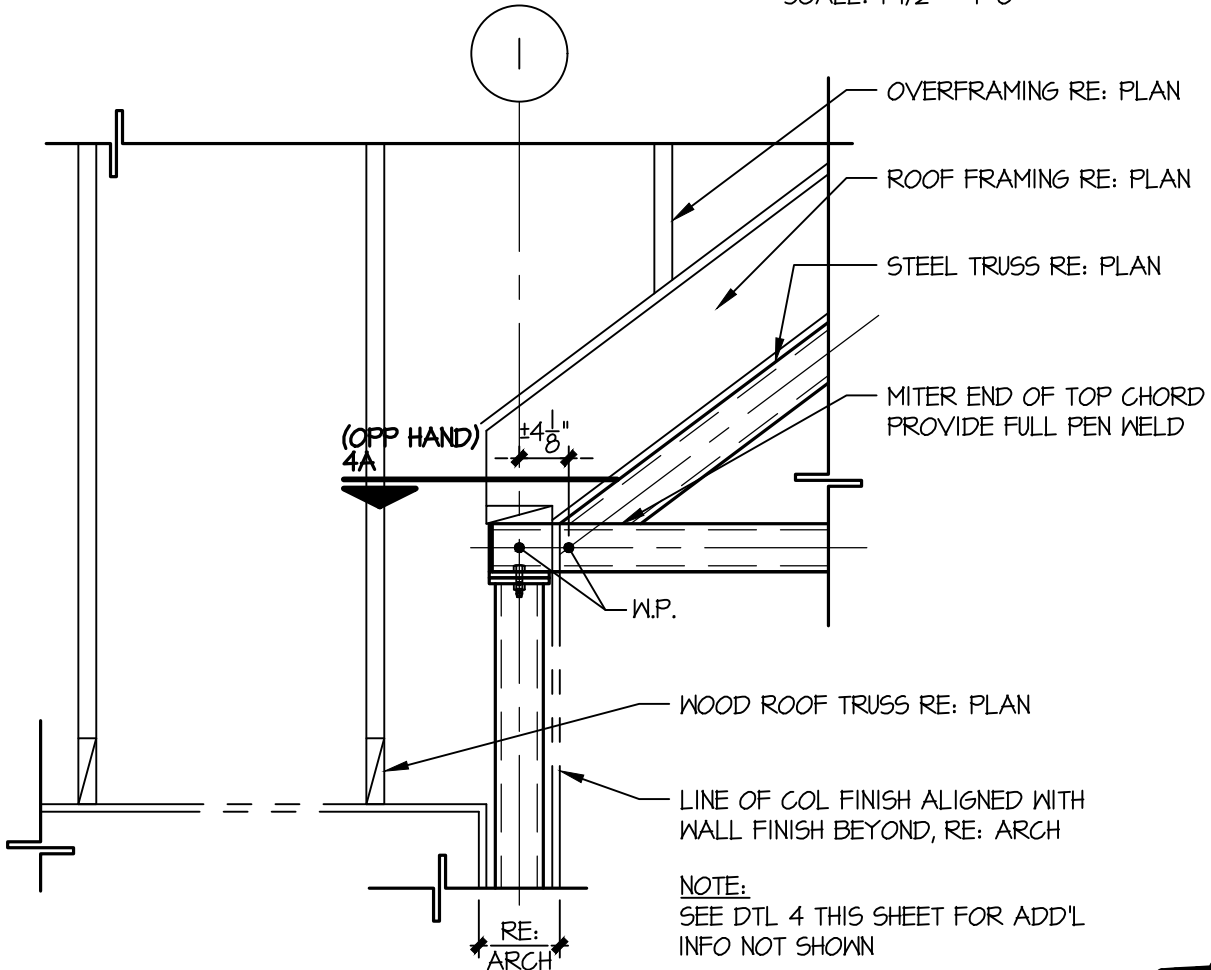


4 DETAIL AT TRUSS TO COL CONNX
SCALE: 3/4" = 1'-0"

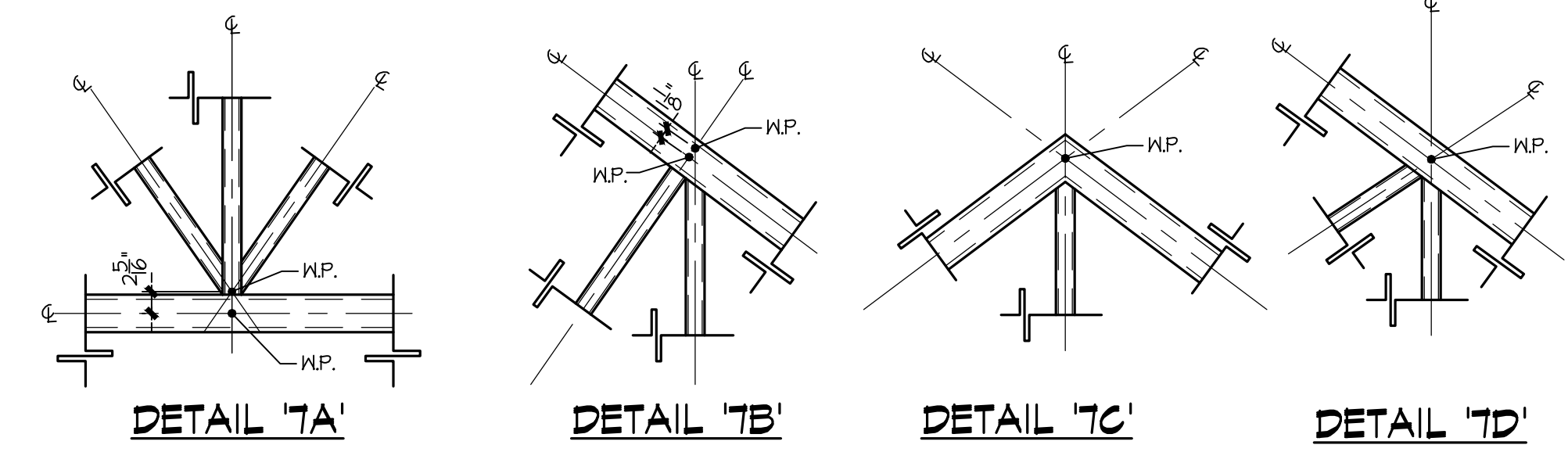
'4A' PLAN DETAIL
SCALE: 3/4" = 1'-0"



5 DETAIL AT ROOF TRANSITION
SCALE: 3/4" = 1'-0"

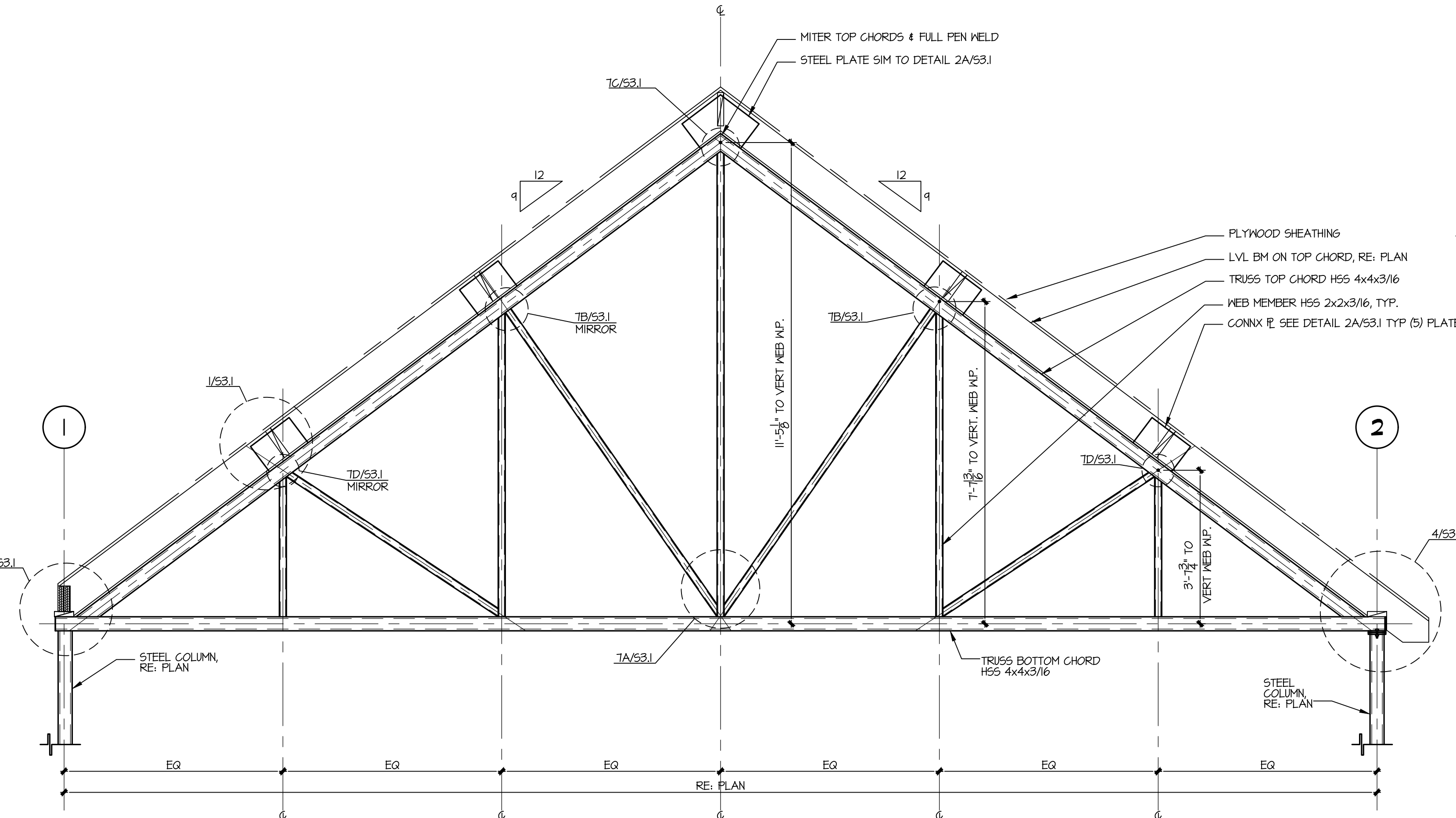


6 DETAIL AT TRUSS TO COL CONNX
SCALE: 3/4" = 1'-0"



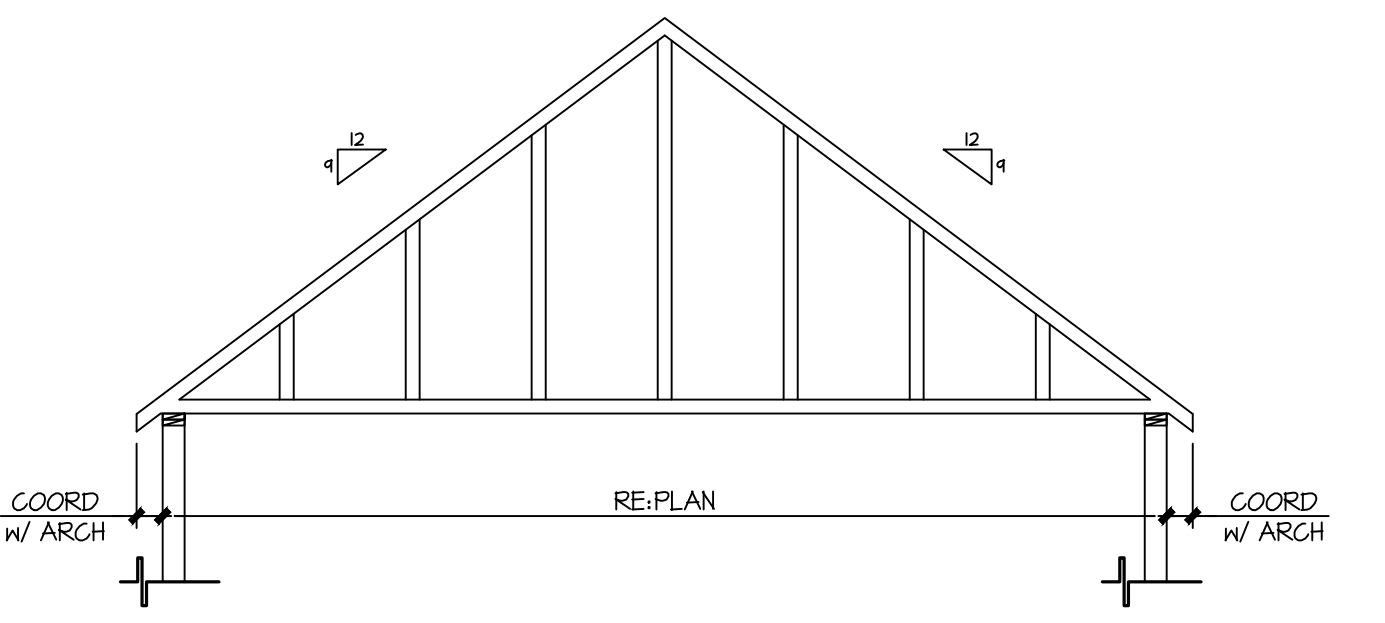
7 STEEL TRUSS MEMBER DETAILS
SCALE: 1/2" = 1'-0"

FABRICATOR NOTE:
MITER ENDS OF HSS MEMBERS AS REQUIRED. PROVIDE 3/16" MIN
FILLET WELD ALL SIDES AND GRIND SMOOTH FOR PAINTED FINISH.
COORD W/ ARCHITECT

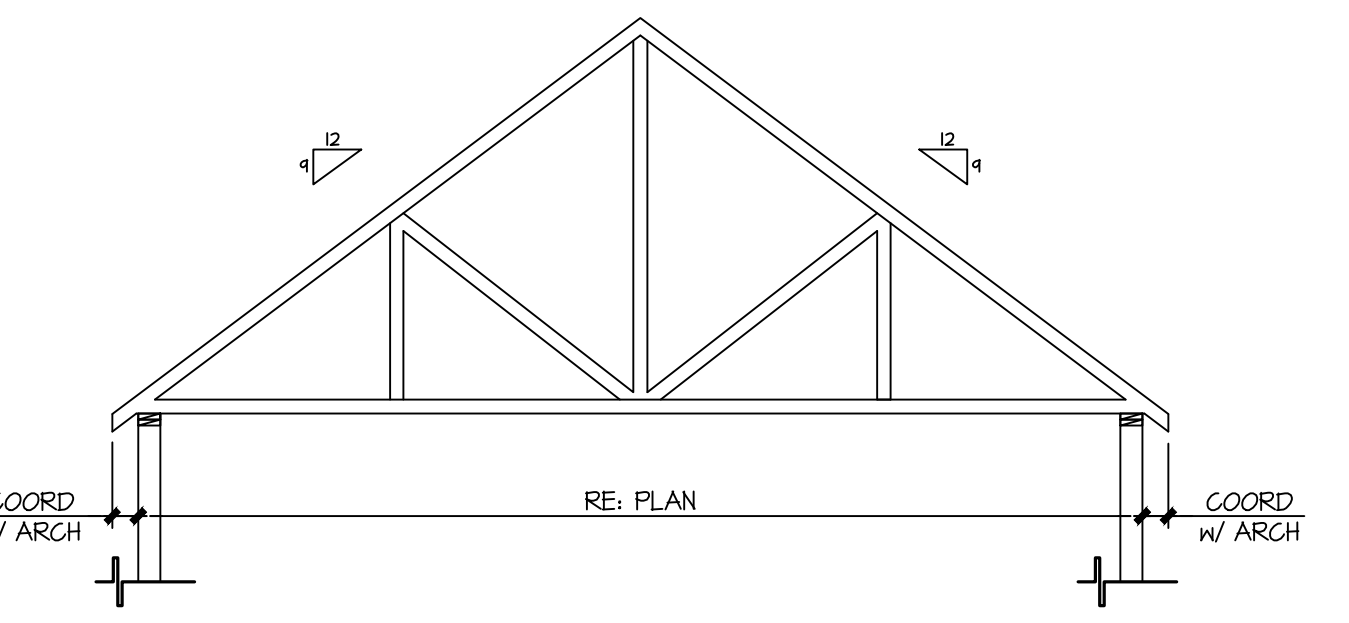


TRUSS PROFILE T-1
SCALE: 1/2" = 1'-0"

NOTES:
1. WELD WEB MEMBERS TO CHORDS WITH MIN. 3/16" FILLET WELD ALL SIDES AND GRIND SMOOTH.
2. TRUSS TO BE SHOP ASSEMBLED AND ERRECTED AS ONE PIECE. DO NOT SPLICE STEEL UNLESS APPROVED BY ARCHITECT & ENGINEER OF RECORD.
3. COORD STEEL FINISH WITH ARCHITECTS DRAWINGS.

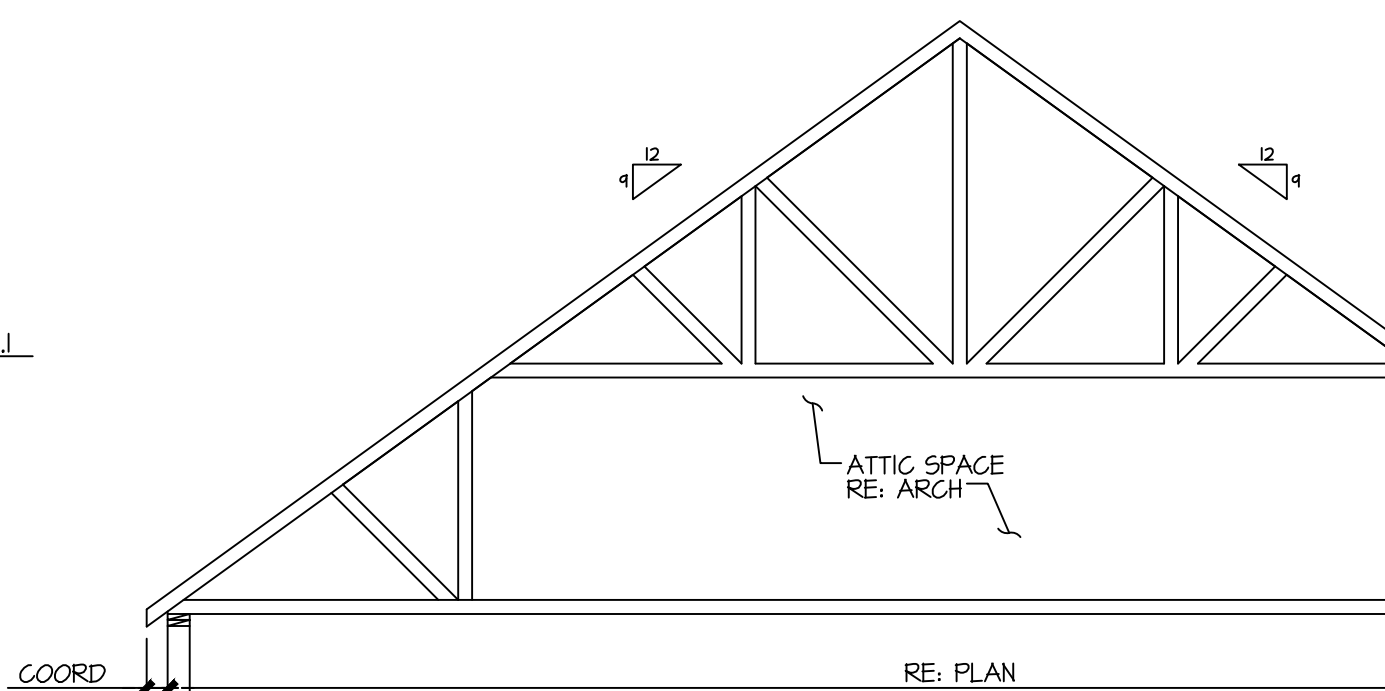


TRUSS PROFILE T-2 (GABLE END)
SCALE: 1/4" = 1'-0"



TRUSS PROFILE T-3
SCALE: 1/4" = 1'-0"

NOTES:
1. PROVIDE SIMPSON H25A HURRICANE CLIPS AT ALL TRUSS CONNECTION TO WALL TOP PLATE OR BEAM.
2. G.C. TO INSTALL STRONGBACKS/BRIDGING AS REQUIRED BY TRUSS MANUF.



TRUSS PROFILE T-4
SCALE: 1/4" = 1'-0"

NOTES:
1. PROVIDE 5/8" PLYWOOD SUBFLOOR IN ATTIC.
2. PROVIDE 5'-0" WIDE x 5'-0" HIGH MIN. CLEAR ATTIC SPACE.
3. PROVIDE SIMPSON H25A HURRICANE CLIPS AT ALL TRUSS CONNECTION TO WALL TOP PLATE OR BEAM.
4. COORD W/ ARCHITECTURAL SECTIONS FOR ATTIC GEOMETRY. RE: PLANSCHED FOR ATTIC LOADING.
5. G.C. TO INSTALL STRONGBACKS/BRIDGING AS REQUIRED BY TRUSS MANUF.
6. TRUSS MANUF TO COORD W/ G.C. & ARCHITECT FOR ANY MECHANICAL EQUIPMENT IN ATTIC & ACCOUNT FOR ADDL. LOADING.

PROJECT GENERAL NOTES

- MOTOR CONTROLLERS, MOTOR STARTERS & DISCONNECTS SHALL BE FURNISHED BY DIVISION 23 AND INSTALLED UNDER DIVISION 26.
- POWER WIRING TO MECHANICAL EQUIPMENT, MOTOR CONTROLLERS AND CONTROL PANELS SHALL BE PROVIDED UNDER DIVISION 26.
- HVAC CONTROL WIRING SHALL BE PROVIDED UNDER DIVISION 23.
- DISCONNECT SWITCHES SHALL BE HEAVY DUTY TYPE WITH LOCKABLE HANDLE. DISCONNECTS FOR ALL ELECTRICALLY DRIVEN HVAC EQUIPMENT SHALL BE FURNISHED BY DIVISION 23 AND INSTALLED BY DIVISION 26.
- STARTERS SHALL BE NEMA COMBINATION MAGNETIC MOTOR STARTERS SIZED PER MOTOR HORSE POWER. COORDINATE MOTOR STARTER TYPE AND FEATURES WITH THE REQUIREMENTS OF THE MECHANICAL EQUIPMENT AND THE CONTROL SYSTEM. PROVIDE OVERLOAD, UNDER VOLTAGE AND PHASE LOSS PROTECTION IN ALL STARTERS. STARTERS FOR MOTORS 50 HORSE POWER AND LARGER SHALL BE REDUCED VOLTAGE TYPE.
- DUCTWORK AND PIPING LAYOUTS ARE SCHEMATIC DIAGRAMS AND ARE INTENDED TO SHOW GENERAL ARRANGEMENT, SIZE AND CAPACITY AND DO NOT INDICATE WHICH PIPE OR DUCT IS ABOVE OR BELOW THE OTHER. ALL OFFSETS ARE NOT NECESSARILY SHOWN. CONTRACTOR SHALL ARRANGE AND COORDINATE THE WORK, FURNISH NECESSARY OFFSETS, VALVES, VENTS, AND FITTINGS TO AVOID CONFLICT WITH OTHER MECHANICAL AND ELECTRICAL SERVICES AND STRUCTURAL AND ARCHITECTURAL ELEMENTS WITHOUT ADDITIONAL COST TO THE OWNER. IF AREAS OF CONFLICT ARE ENCOUNTERED, THE ENGINEER SHALL BE NOTIFIED AND CONTRACTORS' RECOMMENDATIONS SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL BEFORE WORK HAS BEGUN.
- ENTIRE INSTALLATION SHALL COMPLY WITH ALL LOCAL AND STATE CODES AND OTHER AUTHORITIES HAVING JURISDICTION.
- CONTRACTOR SHALL SECURE AND PAY FOR ALL REQUIRED PERMITS AND SHALL ARRANGE ALL REQUIRED INSPECTIONS.
- PROPER FIRE PROTECTION MEASURES, SATISFACTORY TO THE LOCAL FIRE DEPARTMENT SHALL BE TAKEN WHEN WELDING OR CUTTING WITH TORCHES OR ELECTRIC ARC.
- PROVIDE FLEXIBLE CONNECTIONS ON ALL ROTATING EQUIPMENT.
- CONTRACTOR SHALL PROVIDE ALL NECESSARY MISCELLANEOUS STEEL FOR THE SUPPORT OF ALL EQUIPMENT, PIPING, CONDUIT, AND DUCTWORK. SUSPEND FROM SLAB, STEEL, WALL, OR TRUSS WORK.
- BALANCE AND CERTIFY ALL AIR AND WATER SYSTEMS AS PER SPECIFICATIONS. COMPLY WITH REQUIREMENTS OF COMMISSIONING AUTHORITY.
- CONTRACTOR SHALL COORDINATE HIS WORK WITH THE WORK OF ALL OTHER TRADES AND THE EXISTING FIELD CONDITIONS.
- PROVIDE SHUT OFF VALVES AT ALL BRANCH PIPING CONNECTIONS.
- CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CUTTING AND PATCHING OF SLAB REQUIRED AS A RESULT OF HIS WORK.
- MINIMUM SIZE OF ALL CONDENSATE DRAIN PIPING SHALL BE 3/4". MINIMUM SLOPE SHALL BE 1/8" PER FOOT.
- ALL MECHANICAL CONTROLS (THERMOSTATS, ETC.) SHALL BE FURNISHED AND INSTALLED AS PER BARRIER-FREE SUB-CODE OF THE LOCAL GOVERNING CODE.
- UNLESS OTHER WISE NOTED ON THE DRAWINGS, ALL MECHANICAL EQUIPMENT SHALL BE MOUNTED ON VIBRATION ISOLATORS TO PREVENT THE TRANSMISSION OF SOUND TO THE BUILDING STRUCTURE. VIBRATION ISOLATORS SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS AND ON ACTUAL WEIGHT DISTRIBUTION OF THE EQUIPMENT FURNISHED. DEFLECTIONS SHALL BE AS NOTED ON THE EQUIPMENT SHOP DRAWING SUBMITTALS.
- ALL CONDENSATE DRAIN LINES SHALL COMPLY WITH NSPC.
- ALL PENETRATIONS OF FLOORS (WHETHER OR NOT FIRE RESISTANCE RATED) AND ALL PENETRATIONS OF FIRE RATED WALLS AND FLOORS SHALL BE PROVIDED WITH A THROUGH PENETRATION PROTECTION SYSTEM (FIRE STOPPING). EACH THROUGH-PENETRATION PROTECTION SYSTEM SHALL BE TESTED IN ACCORDANCE WITH ASTM E814 AND BE LISTED FOR THE TYPE OF FLOOR OR WALL ASSEMBLY PENETRATED AND THE TYPE OF PROTECTION SYSTEM. REFER TO SECTION OF THE SPECIFICATION FOR ADDITIONAL INFORMATION.
- ALL REMOVED EQUIPMENT, MATERIAL AND DEBRIS SHALL BE LEGALLY DISPOSED OF BY THIS CONTRACTOR.
- CONTRACTOR SHALL ENSURE THAT ALL MECHANICAL DEVICES WILL BE INSTALLED IN A LOCATION WHICH AFFORDS ACCESSIBILITY FOR MAINTENANCE AND REPAIR. COORDINATE INSTALLATION AMONG ALL TRADES TO AVOID INTERFERENCE, AND LOCATE EQUIPMENT TO PROVIDE CLEARANCE OR EXCEED THOSE RECOMMENDED BY THE MANUFACTURER.
- INSTALL ALL DIELECTRIC UNIONS IN A MANNER WHICH MAKE THEM READILY ACCESSIBLE FOR FUTURE REPAIR OR REPLACEMENT.
- CONTRACTOR SHALL DRAIN AND REFILL ALL PIPING AS REQUIRED.
- FURNISH LOCAL DISCONNECT SWITCHES FOR ALL ELECTRICALLY DRIVEN HVAC EQUIPMENT. DISCONNECT SWITCH SHALL BE IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.
- CONTRACTOR SHALL VISIT JOB SITE AND VERIFY EXISTING CONDITIONS PRIOR TO SUBMISSION OF BID.
- ALL INTERIOR PIPING SHALL BE SUPPORTED FROM THE STRUCTURE ABOVE.
- ALL CONTROL WIRING SHALL BE CONCEALED IN WALLS, ABOVE CEILINGS, ETC. IN FINISHED / OCCUPIED AREAS. WHERE CONTROL WIRING IS EXPOSED, INSTALL WIRING IN CONDUIT.
- WHERE PIPING CONNECTIONS FOR THE EQUIPMENT SUCH AS PUMPS, AC UNITS, COILS, ETC. DIFFER FROM THE LINE SIZE, IT SHALL BE THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR TO FURNISH AND INSTALL THE NECESSARY REDUCERS OR EXPANDER FITTINGS TO ENABLE CONNECTION BETWEEN THE PIPING SYSTEM AND THE EQUIPMENT.
- ALL DRAINAGE PIPING SHALL BE SLOPED AT A MINIMUM OF 1/8" PER FOOT.
- ALL INSULATION PROVIDED FOR THE PROJECT MUST MEET A MAXIMUM FLAME SPREAD RATING OF 25 AND SMOKE DEVELOPED OF 50 OR LESS, AS TESTED IN ACCORDANCE WITH ASTM, NFPA & U.L. GUIDELINES.
- ALL EQUIPMENT FOR THIS PROJECT SHALL BE LISTED BY A NATIONALLY RECOGNIZED TESTING LABORATORY.
- CONTRACTOR SHALL SUBMIT DIMENSIONED, COORDINATED SHOP DRAWINGS FOR ENGINEERS APPROVAL. DRAWING SHALL INDICATE ALL TRADES, (ELECTRICAL, MECHANICAL, PLUMBING, FIRE PROTECTION AND INFRASTRUCTURE).
- UNLESS OTHERWISE SPECIFIED, ALL MOTORS 1/2 H.P. AND ABOVE SHALL BE 3 PHASE AND MOTORS UNDER 1/2 H.P. SHALL BE SINGLE PHASE.
- THE MECHANICAL CONTRACTOR SHALL COORDINATE THE ELECTRICAL REQUIREMENTS OF HIS WORK WITH THE GENERAL AND ELECTRICAL CONTRACTORS PRIOR TO SUBMISSION OF BIDS.
- THE ABBREVIATIONS BMS (BUILDING MANAGEMENT SYSTEM) AND BAS (BUILDING AUTOMATION SYSTEM) ARE USED INTERCHANGEABLY.
- ALL AIR MOVING DEVICES, INCLUDING NOT LIMITED TO, AIR HANDLING UNITS AND AIR CONDITIONING UNITS MUST COMPLY WITH AMCA STANDARD 210 AND ASHRAE.
- WALL MOUNTED THERMOSTAT LOCATIONS SHALL BE COORDINATED WITH THE OWNER PRIOR TO INSTALLATION.
- ALL DRAWING SCALES INDICATED IN THE CONTRACT DOCUMENTS SHALL BE VERIFIED AGAINST ACTUAL FIELD CONDITIONS AND DIMENSIONS BY THE CONTRACTOR PRIOR TO BID SUBMISSION.
- THE MECHANICAL CONTRACTOR SHALL COORDINATE THE ELECTRICAL REQUIREMENTS OF HIS WORK WITH THE GENERAL AND ELECTRICAL CONTRACTORS PRIOR TO SUBMISSION OF BIDS.
- CONTRACTOR SHALL PATCH ALL OPENINGS LEFT BY THE REMOVAL OF PIPING, CONDUIT, DUCTS, ETC. TO MATCH SURROUNDING CONSTRUCTION AND FINISHES.

MECHANICAL SYMBOLS

| IDENTIFIER | DESCRIPTION | IDENTIFIER | DESCRIPTION |
|------------|--|------------|---|
| HWS | HEATING HOT WATER SUPPLY | [Symbol] | REDUCER (ECCENTRIC) |
| HWR | HEATING HOT WATER RETURN | [Symbol] | VALVE ON RISER |
| CWS | CHILLED WATER SUPPLY | [Symbol] | ANGLE VALVE |
| CWR | CHILLED WATER RETURN | [Symbol] | PRESSURE RELIEF VALVE |
| CD | CONDENSATE DRAIN | [Symbol] | CONTROL VALVE (2-PORT) |
| PC | PUMPED CONDENSATE | [Symbol] | CONTROL VALVE (3-PORT) |
| R | REFRIGERANT PIPING | [Symbol] | PIPE ANCHOR |
| [Symbol] | PRESSURE REDUCING VALVE (SELF-CONTAINED) | [Symbol] | MOMENT GUIDES |
| [Symbol] | PRESSURE REDUCING VALVE (REMOTE TYPE) | [Symbol] | OPEN-ENDED PIPE |
| [Symbol] | STEAM PRESSURE GAUGE W/ SHUT-OFF | [Symbol] | PIPE TO BE DEMOLISHED |
| [Symbol] | PRESSURE GAUGE W/ SHUT-OFF | [Symbol] | CONNECT TO EXISTING |
| [Symbol] | THERMOMETER W/ SHUT-OFF | [Symbol] | DUCT UNDER POSITIVE PRESSURE |
| [Symbol] | Y-TYPE STRAINER W/ BLOWDOWN & HOSE BIBB | [Symbol] | DUCT UNDER NEGATIVE PRESSURE |
| [Symbol] | UNION | [Symbol] | ROUND DUCT |
| [Symbol] | MANUAL AIR VENT | [Symbol] | SUPPLY REGISTER |
| [Symbol] | AUTOMATIC AIR VENT | [Symbol] | RETURN OR EXHAUST REGISTER |
| [Symbol] | PIPE TURNING UP | [Symbol] | VOLUME DAMPER |
| [Symbol] | PIPE TURNING DOWN | [Symbol] | FIRE DAMPER W/ACCESS DOOR |
| [Symbol] | PITCH DOWN | [Symbol] | BAROMETRIC DAMPER |
| [Symbol] | DIRECTION OF FLOW | [Symbol] | MOTORIZED DAMPER |
| [Symbol] | CAPPED PIPE | [Symbol] | AIRFLOW THRU UNDERCUT |
| [Symbol] | EXPANSION JOINT | [Symbol] | AIRFLOW THRU LOUVERED DOOR |
| [Symbol] | BALL VALVE | [Symbol] | THERMOSTAT (WALL MOUNTED) |
| [Symbol] | SWING TYPE CHECK VALVE | [Symbol] | AIR DEVICE TYPE |
| [Symbol] | GATE VALVE | [Symbol] | AIR QUANTITY |
| [Symbol] | GLOBE VALVE | [Symbol] | DUCTWORK TO BE DEMOLISHED |
| [Symbol] | BUTTERFLY VALVE | [Symbol] | SENSOR |
| [Symbol] | CALIBRATED BALANCING VALVE | [Symbol] | FLEXIBLE CONNECTION (DOUBLE LINE) |
| [Symbol] | TRIPLE-DUTY VALVE | [Symbol] | FLEXIBLE CONNECTION (SINGLE LINE) |
| [Symbol] | REDUCER (CONCENTRIC) | [Symbol] | EXISTING DUCTWORK TO REMAIN |
| [Symbol] | GAS COCK | [Symbol] | THERMOMETER |
| [Symbol] | PRESSURE REGULATOR (LOCK UP TYPE) | [Symbol] | PUMP |
| [Symbol] | GAS PIPING | [Symbol] | BOILER/BURNER PANEL EMERGENCY POWER OFF PUSH BUTTON |
| [Symbol] | SANITARY SEWER PIPING | [Symbol] | HUMIDISTAT |
| [Symbol] | SANITARY VENT PIPING | [Symbol] | CARBON DIOXIDE (CO2) SENSOR |

* NOTE THAT NOT ALL SYMBOLS APPLY TO THE PROJECT

SYMBOL LIST

| SYMBOL | DESCRIPTION |
|----------|--|
| [Symbol] | PLAN OR DETAIL TAG DRAWING # TO LOCATE DETAIL DETAIL # |
| [Symbol] | SECTION TAG DRAWING # TO LOCATE SECTION DETAIL # |
| [Symbol] | ELEVATION TAG DRAWING # TO LOCATE ELEVATION DETAIL # |
| [Symbol] | KEY NOTE SYMBOL |
| [Symbol] | KEY NOTES APPLYING TO SAME ITEM |
| [Symbol] | CONNECT TO EXISTING |

GENERAL ABBREVIATIONS

| IDENTIFIER | DESCRIPTION | IDENTIFIER | DESCRIPTION |
|------------|--------------------------------|------------|------------------------|
| AFF | ABOVE FINISHED FLOOR | MC | MECHANICAL CONTRACTOR |
| AFG | ABOVE FINISHED GRADE | MCA | MINIMUM CIRCUIT AMPS |
| ATC | AUTOMATIC TEMPERATURE CONTROLS | MEZZ | MEZZANINE |
| BAS | BUILDING AUTOMATION SYSTEM | MFG | MANUFACTURER |
| BFG | BELOW FINISHED GRADE | MH | MOUNTING HEIGHT |
| BLDG | BUILDING | MIN | MINIMUM |
| BMS | BUILDING MANAGEMENT SYSTEM | MOD | MOTOR OPERATED DAMPER |
| CONN'S | CONNECTIONS | MTD | MOUNTED |
| CLG | CEILING | NC | NORMALLY CLOSED |
| CO | COMPANY | NIC | NOT IN CONTRACT |
| CONTR | CONTRACTOR | NO | NORMALLY OPEN |
| CTE | CONNECT TO EXISTING | NTS | NOT TO SCALE |
| DN | DOWN | OC | ON CENTER |
| DWG(S) | DRAWING(S) | PC | PLUMBING CONTRACTOR |
| EC | ELECTRICAL CONTRACTOR | PSI | POUNDS PER SQUARE INCH |
| EM | EMERGENCY | PVC | POLYVINYL CHLORIDE |
| EQUIP | EQUIPMENT | RLA | RUNNING LOAD AMPS |
| ETR | EXISTING TO REMAIN | RPM | REVOLUTIONS PER MINUTE |
| EWG | ELECTRIC WATER COOLER | SDD | DUCT SMOKE DETECTOR |
| EX | EXISTING | SQ. FT. | SQUARE FEET |
| FLA | FULL LOAD AMPS | TYP | TYPICAL |
| FS | FLOW SWITCH | VSD | VARIABLE SPEED DRIVE |
| GC | GENERAL CONTRACTOR | | |
| HP | HORSEPOWER | | |
| MAX | MAXIMUM | | |

* NOTE THAT NOT ALL ABBREVIATIONS APPLY TO THE PROJECT *

MECHANICAL ABBREVIATIONS

| IDENTIFIER | DESCRIPTION | IDENTIFIER | DESCRIPTION |
|------------|------------------------------|------------|--------------------------|
| CD | CONDENSATE DRAIN | O/A | OUTSIDE AIR |
| CFM | CUBIC FEET PER MINUTE | OAI | OUTSIDE AIR INTAKE |
| CR | CEILING REGISTER | OED | OPEN ENDED DUCT |
| CU | CONDENSING UNIT | R | REFRIGERANT |
| CW | COLD WATER | R/A | RETURN AIR |
| DB | DRY BULB | RAV | RELIEF AIR VENT |
| DEF | DISHWASHER EXHAUST FAN | RG | RETURN GRILLE |
| DN | DOWN | RH | RELATIVE HUMIDITY |
| E/A | EXHAUST AIR | RL | REFRIGERANT LIQUID LINE |
| EAT | ENTERING AIR TEMPERATURE | RR | RETURN REGISTER |
| EDB | ENTERING DRY BULB | RS | REFRIGERANT SUCTION LINE |
| EER | ENERGY EFFICIENCY RATIO | RTU | ROOFTOP UNIT |
| EG | EXHAUST GRILLE | S/A | SUPPLY AIR |
| EH | ELECTRIC HEATER | SD | SMOKE DAMPER |
| ESP | EXTERNAL STATIC PRESSURE | SE | SMOKE EXHAUST |
| EWB | ENTERING WET BULB | SF | SUPPLY FAN |
| EF | EXHAUST FAN | SR | SUPPLY REGISTER |
| FD | FIRE DAMPER WITH ACCESS DOOR | T | THERMOSTAT |
| FFM | FEET PER MINUTE | TG | TRANSFER GRILLE |
| G | GAS | TO | TRANSFER OPENING |
| GPM | GALLONS PER MINUTE | TR | TOP REGISTER |
| HUM | HUMIDIFIER | TT | THERMOSTATIC TRAP |
| HX | HEAT EXCHANGER | UH | UNIT HEATER |
| KEF | KITCHEN EXHAUST FAN | UV | UNIT VENTILATOR |
| LAT | LEAVING AIR TEMPERATURE | VD | VOLUME DAMPER |
| MAU | MAKE UP AIR UNIT | VEF | VENTILATION EXHAUST FAN |
| MBH | THOUSAND BTU PER HOUR | WB | WET BULB |
| MOD | MOTOR OPERATED DAMPER | W.C. | WATER COLUMN |
| N.C. | NORMALLY CLOSED | WG | WATER GAUGE |
| N.O. | NORMALLY OPEN | WMS | WIRE MESH SCREEN |

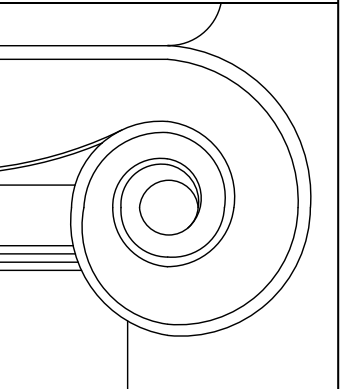
* NOTE THAT NOT ALL ABBREVIATIONS APPLY TO THE PROJECT *

GENERAL NOTES (APPLY TO ALL DRAWINGS)

- UNLESS OTHERWISE NOTED, ALL DUCTWORK IS ROUTED ON ROOF OR EXPOSED BELOW ROOF BETWEEN AND / OR THROUGH JOISTS.
- THE CONTRACTOR SHALL COORDINATE WITH ALL OTHER TRADES FOR POSSIBLE INTERFERENCE WITH HIS WORK AND THE WORK OF OTHERS FROM NEW AND EXISTING CONDITIONS.
- SIZES SHOWN ON PLANS FOR DUCTWORK ARE CLEAR INSIDE DIMENSIONS, WHEN LINING IS PROVIDED, INCREASE THE SIZE ACCORDINGLY.
- DUCTWORK LAYOUTS ARE DIAGRAMMATIC AND INTEND TO SHOW A GENERAL ARRANGEMENT, SIZE AND CAPACITY. ALL OFFSETS ARE NOT NECESSARILY SHOWN. CONTRACTOR SHALL ARRANGE AND COORDINATE THE WORK, FURNISH NECESSARY OFFSETS, VALVES, VENTS, AND FITTINGS TO AVOID CONFLICT WITH OTHER MECHANICAL AND ELECTRICAL SERVICES AND WITH STRUCTURAL AND ARCHITECTURAL ELEMENTS
- CONTRACTOR IS RESPONSIBLE FOR BALANCING AIR QUANTITIES AS SHOWN ON THE FLOOR PLANS FOR HVAC EQUIPMENT, REGISTERS, GRILLES AND DIFFUSERS. COMPLY WITH REQUIREMENTS OF COMMISSIONING AUTHORITY.
- WHILE ALL ATTEMPTS AT ACCURACY HAVE BEEN TAKEN, NO GUARANTEE OF AN EXACT REPRESENTATION OR COMPLETENESS IS IMPLIED. RESPONSIBILITY FOR FINAL VERIFICATION FALLS TO THE CONTRACTOR. ANY UNRESOLVED DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER FOR RESOLUTION.
- SEE SCHEDULES AND DETAILS FOR ADDITIONAL INFORMATION.
- ALL DUCTWORK EXPOSED BELOW ROOF IN SPACE SHALL BE INTERNALLY INSULATED AND PRIMED / PAINTED AS PER ARCHITECT'S COLOR CHOICE WITH SUITABLE ADHERING COMPOUNDS FOR THE SHEETMETAL MATERIAL BEING PAINTED.
- PIPING INSULATION SHALL BE CONTINUOUS AT HANGER SUPPORTS NOT TO COMPROMISE THE INSULATION VAPOR BARRIER.
- ALL EXISTING DUCT SYSTEMS (SUPPLY / RETURN / OA DUCTS, GRILLES, ETC.) SHALL BE THOROUGHLY PROFESSIONAL CLEANED.
- CONTRACTOR SHALL TO PATCH ALL DISTURBED FINISHES WITH MATERIAL AND ASSEMBLIES TO MATCH EXISTING AND / OR NEW CONSTRUCTION AND FINISHES (TYPICAL). COORDINATE WITH ARCHITECT.

HVAC DESIGN CRITERIA

- APPLICABLE CODES AND REFERENCES:
 - INTERNATIONAL BUILDING CODE - 2018
 - ASHRAE / IES STANDARD 90.1 - 2016
 - INTERNATIONAL MECHANICAL CODE - 2018
 - INTERNATIONAL FUEL GAS CODE - 2018
 - NATIONAL STANDARD PLUMBING CODE - 2018
 - UNIFORM CONSTRUCTION CODE OF NEW JERSEY
- SUMMER OUTDOOR DESIGN CONDITIONS (PER ASHRAE FUNDAMENTALS - 2017):
 - DRY BULB: 94.3 DEG. F.
 - WET BULB: 74.4 DEG. F. *
 - ASHRAE 0.4 % COOLING DRY BULB/MEAN WET BULB FOR NEWARK, NEW JERSEY.
- SUMMER INDOOR DESIGN CONDITIONS:
 - DRY BULB: 75 DEG. F. (+/- 2 DEG. F.)
 - RELATIVE HUMIDITY: 50%
- WINTER OUTDOOR DESIGN CONDITIONS (PER ASHRAE FUNDAMENTALS - 2017):
 - DRY BULB: 12.8 DEG. F. *
 - ASHRAE 99.6 % DESIGN DAY DRY BULB FOR NEWARK, NEW JERSEY.
- WINTER INDOOR DESIGN CONDITIONS:
 - DRY BULB: 70 DEG. F. (+/- 2 DEG. F.)
 - RELATIVE HUMIDITY: NO MINIMUM HUMIDITY CONTROL PROVIDED



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PROJECT No.: 1836C

DATE: 30 JUNE 2021

REVISIONS:

DRAWN BY: JGP

RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
 TOWNSHIP OF PISCATAWAY
 MIDDLESEX COUNTY, NEW JERSEY



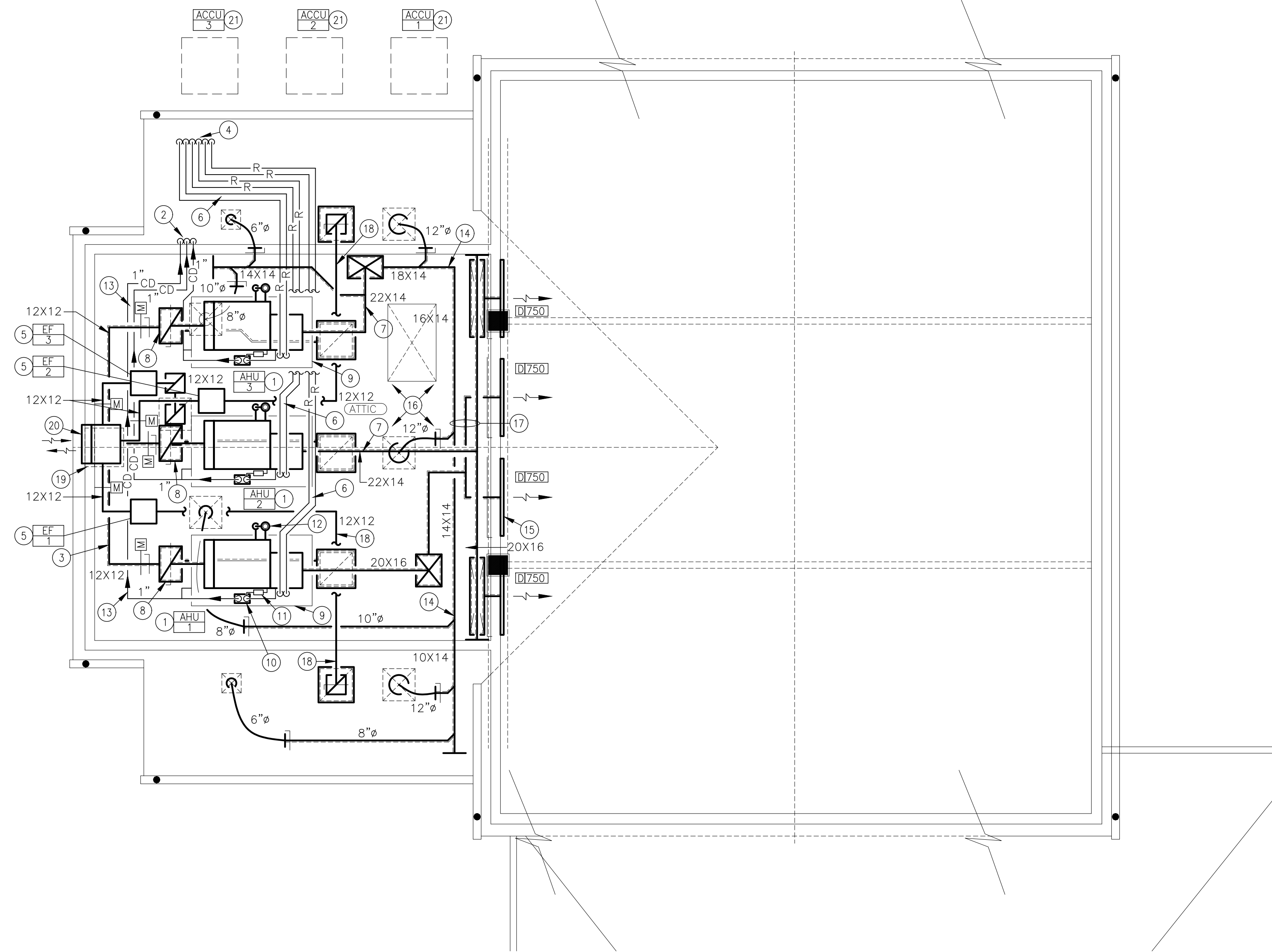
KSI CONSULTING ENGINEERS, LLC
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 CERTIFICATE OF AUTHORIZATION NO. 24GA28124300

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James Sarno Jr., P.E.
 Professional Engineer
 State of New Jersey

DATE:
 NEW JERSEY PROFESSIONAL ENGINEER
 LICENSE NUMBER: 451590

M0.1



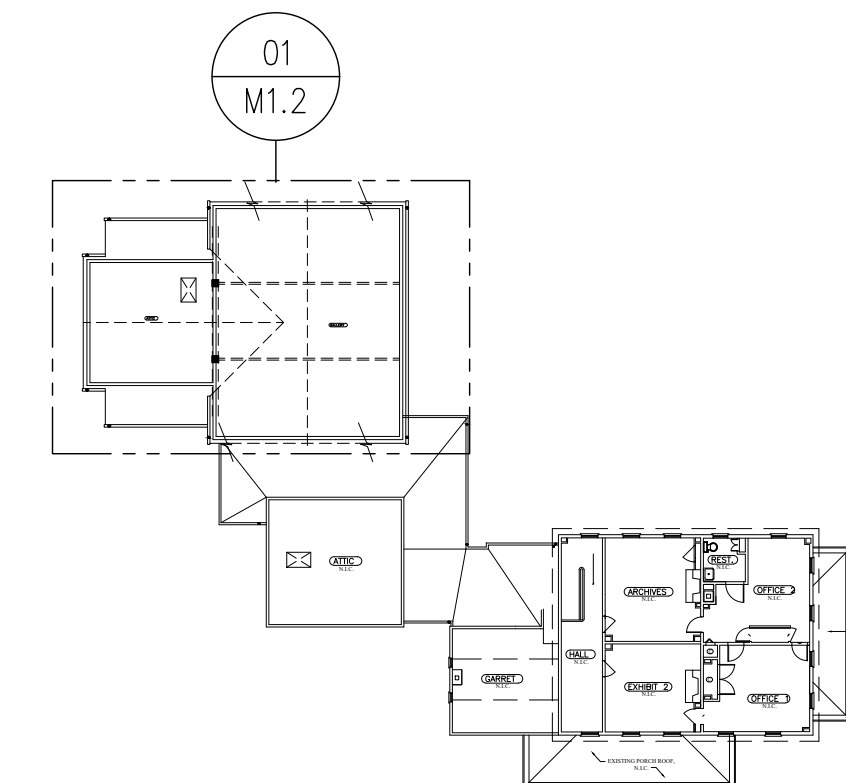
01 MECHANICAL ATTIC PART PLAN
M1.2 1/4"=1'-0"

KEY NOTES (1, 2)

- HIGH-EFFICIENCY GAS-FIRED FURNACE WITH DX COOLING SPLIT SYSTEM SUSPENDED TIGHT TO BOTTOM OF RAFTERS. ROUTE REFRIGERANT, POWER AND CONTROL LINES TO RESPECTIVE ACCU LOCATED OUTDOORS. ROUTE AC AND NEUTRALIZED FLUE CONDENSATE TO CONDENSATE PUMP. COORDINATE LOCATION OF UNITS AND MAINTAIN REQUIRED CLEARANCES. SUPPORT UNIT AS RECOMMENDED BY MANUFACTURER. INTERLOCK WITH OA MOTORIZED DAMPER AND EXHAUST FAN. SEE DETAIL AND SCHEDULES FOR MORE INFORMATION.
- ROUTE CONDENSATE PIPING DOWN WALL IN UTILITY ROOM TO FLOOR DRAIN.
- OUTSIDE AIR DUCT WITH MOTORIZED DAMPER TO OA INTAKE LOUVER IN ATTIC. INTERLOCK DAMPER OPEN/CLOSE WITH UNIT OPERATION. COORDINATE ROUTING WITH ATTIC STRUCTURE, ALL TRADES AND TO ALLOW AHU ACCESS. SUPPORT DUCT FROM STRUCTURE AS REQUIRED. TYPICAL FOR EACH UNIT.
- ROUTE REFRIGERANT PIPING DOWN TO ACCU. COORDINATE ROUTING WITH FLOOR PLAN.
- INLINE EXHAUST FAN INSTALLED IN ATTIC UP IN RAFTER OPENINGS TO OPTIMIZE ATTIC AND EQUIPMENT ACCESS. SUPPORT FAN FROM STRUCTURE. INTERLOCK WITH MOTORIZED DAMPER AND AHU OPERATION. SEE SCHEDULES AND DETAILS FOR MORE INFORMATION.
- SIZE AND PROVIDE QUANTITIES OF REFRIGERANT PIPING AS PER MANUFACTURER'S RECOMMENDATIONS (QUANTITIES SHOWN ARE FOR DIAGRAMMATIC PURPOSES AND MAY NOT REPRESENT ALL PIPING REQUIRED) IN ATTIC. SUPPORT PIPING FROM STRUCTURE AND COORDINATE ROUTING WITH ALL TRADES. INSULATE PIPING AS PER SPECIFICATIONS. INSULATION SHALL BE CONTINUOUS THROUGH THE SUPPORT CLAMPS. TYPICAL FOR ALL REFRIGERANT PIPING.
- SUPPLY AIR DUCT MOUNTED IN ATTIC SPACE. INSTALL DUCT TIGHT TO UNDERSIDE OF RAFTERS TO OPTIMIZE ATTIC AND EQUIPMENT ACCESS. SUPPORT DUCT FROM STRUCTURE AS REQUIRED.
- 22"x14" RETURN AIR DUCT MOUNTED IN ATTIC SPACE. INSTALL/ROUTE DUCT UNDER UNIT TO CEILING REGISTER. ROUTE DUCT NOT TO BLOCK EQUIPMENT ACCESS.
- PROVIDE SECONDARY DRIP PAN WITH 1" HIGH LIP AND 1" DRAIN CONNECTION UNDER UNIT AND ASSOCIATED COMPONENTS. CONNECT DRAIN TO CONDENSATE PIPING. DRIP PAN SHALL BE OF CORROSION RESISTANT MATERIAL. PITCH PAN TOWARDS DRAINING POINT. TYPICAL.
- CONDENSATE PUMP MOUNTED NEXT TO UNIT IN DRIP PAN (NOT TO OBSTRUCT ACCESS TO UNIT). PROVIDE CONDENSATE PUMP MANUFACTURED BY LITTLE GIANT MODEL NUMBER VCMA-20ULS, 1/30HP, 115V/1PH/60HZ, 1.5A, WITH 1/2 GALLON ABS TANK, CHECK VALVE AND SAFETY SWITCH. PROVIDE 115V/1PH DUPLEX RECEPTACLE WITH CIRCUIT. TYPICAL.
- PROVIDE FACTORY NEUTRALIZER KIT FOR FLUE CONDENSATE. INSTALL NEUTRALIZER BEFORE CONDENSATE PUMP CONNECTION. COORDINATE LOCATION OF UNITS AND MAINTAIN REQUIRED CLEARANCES. TYPICAL.
- 3" PVC SEALED POSITIVE PRESSURE COMBUSTION AIR AND VENT PIPING (CONFIRM VENT MATERIAL WITH MANUFACTURER) FROM AHU UP THROUGH ROOF WITH SINGLE PENETRATION CONCENTRIC ADAPTER AND SEAL WEATHER TIGHT. SUPPORT PIPING FROM STRUCTURE AND COORDINATE WITH ALL EXISTING AND NEW CONDITIONS, OTHER TRADES, ETC. SEE DETAIL FOR MORE INFORMATION. TYPICAL.
- 1" CONDENSATE PIPING MOUNTED/ROUTED ATTIC SPACE. PITCH PIPING TOWARDS DRAINING POINT A MINIMUM OF 1/8" PER FT. COORDINATE ALL PIPE ROUTINGS NOT TO OBSTRUCT SPACE OR EQUIPMENT ACCESS. COORDINATE FINAL LOCATION WITH ALL TRADES AND EQUIPMENT. TYPICAL.
- SUPPLY AIR DUCT MOUNTED IN ATTIC SPACE. INSTALL DUCT LOW TO ATTIC FLOOR TO ROUTE UNDER OTHER DUCT MAINS. ROUTE DUCT TO OPTIMIZE ATTIC AND EQUIPMENT ACCESS AS REQUIRED. SUPPORT DUCT AS REQUIRED.
- MOUNT LINEAR SLOT DIFFUSER APPROXIMATELY 11'-8" AFF. COORDINATE WITH FLOOR PLAN AND STRUCTURE. TYPICAL FOR 4.
- MAINTAIN ACCESS IN ATTIC TO SERVICE EQUIPMENT. COORDINATE AND OPTIMIZE ALL DUCT AND PIPING ROUTINGS NOT TO OBSTRUCT ACCESS.
- ALL DUCT MAINS SHALL BE STACKED ALONG ATTIC WALL. ROUTE DUCTS TO OPTIMIZE ATTIC AND EQUIPMENT ACCESS.
- ROUTE EXHAUST DUCT HIGH THROUGH ATTIC UP BETWEEN RAFTERS TO OPTIMIZE ATTIC AND EQUIPMENT ACCESS. TYPICAL.
- NEW STORM-PROOF OUTSIDE AIR INTAKE LOUVER WITH BIRDSCREEN MANUFACTURED BY GREENHECK MODEL ESJ-602 SIZE 24"Wx30"Hx6"D, FREE AREA 2.36 SQFT, OR APPROVED EQUAL. MOUNT LOUVER IN EXTERIOR WALL 3'-0" MINIMUM BELOW EXHAUST AIR DISCHARGE LOUVER (STACKED INLINE). COORDINATE OPENING WITH BUILDING CONSTRUCTION AS REQUIRED. PROVIDE 18" MINIMUM DEEP INSULATED OUTSIDE AIR DUCT PLENUM CONNECTION TO LOUVER.
- NEW STORM-PROOF EXHAUST AIR DISCHARGE LOUVER WITH BIRDSCREEN MANUFACTURED BY GREENHECK MODEL ESJ-602, SIZE 24"Wx30"Hx6"D, FREE AREA 2.36 SQFT, OR APPROVED EQUAL. MOUNT LOUVER HIGH IN EXTERIOR WALL CLOSE TO PEAK, 3'-0" MINIMUM ABOVE OA INTAKE LOUVER (STACKED INLINE). COORDINATE OPENING WITH BUILDING CONSTRUCTION AS REQUIRED. PROVIDE 18" MINIMUM DEEP OUTSIDE AIR DUCT PLENUM CONNECTION TO LOUVER.
- NEW AIR COOLED CONDENSING UNIT FOR RESPECTIVE AHU SPLIT SYSTEM ON GRADE. SEE FLOOR PLAN FOR MORE DETAILS.

GENERAL NOTES

- CONTRACTOR TO PATCH ALL DISTURBED FINISHES WITH MATERIAL AND ASSEMBLIES TO MATCH ADJACENT SURFACES AND FINISHES (TYPICAL).
- ALL DUCT AND PIPING ROUTINGS ARE PROPOSED AND SHALL BE COORDINATED WITH WALL, CEILING AND FLOOR CONSTRUCTION AND ALL OTHER TRADES. RE-ROUTING OF PIPING AND DUCTS MAY BE REQUIRED TO AVOID TRADE CONFLICTS.
- FURNISH ALL CONTROLS COMPONENTS (THERMOSTATS, SENSORS, WIRING, POWER, ETC.) REQUIRED FOR A COMPLETE FULLY OPERATIONAL SYSTEM.
- ALL ATTIC DUCTS SHALL BE INTERNALLY INSULATED/LINED WITH 1" THICK LINING (NO DUCT INSULATION WRAP). DUCT SIZES INDICATED ACCOUNT FOR LINING THICKNESS.



02 SECOND FLOOR KEY PLAN
M1.2 1/32"=1'-0"



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James Sarro Jr., P.E.
 Professional Engineer
 State of New Jersey

DATE:
 NEW JERSEY PROFESSIONAL ENGINEER
 LICENSE NUMBER: 451590

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PROJECT No.: 1836C

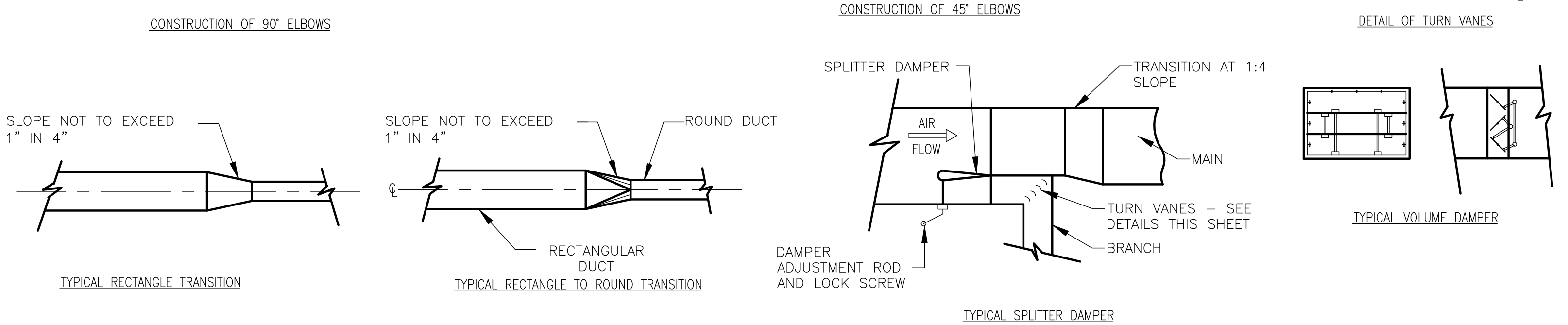
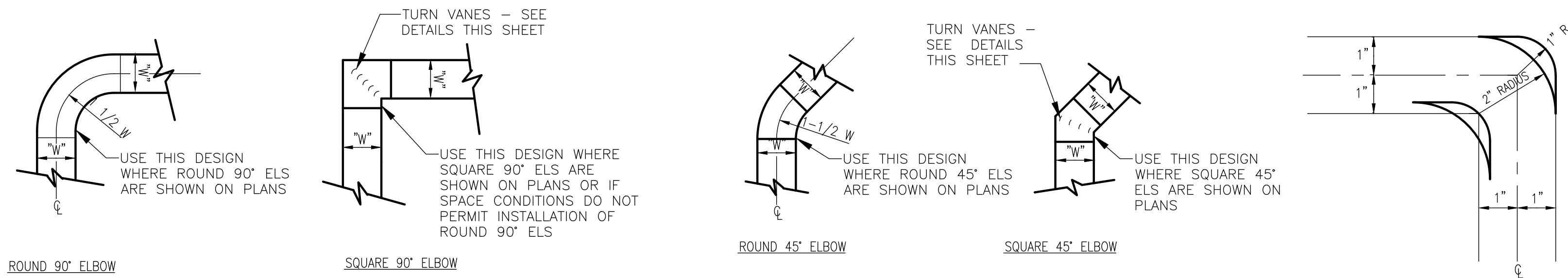
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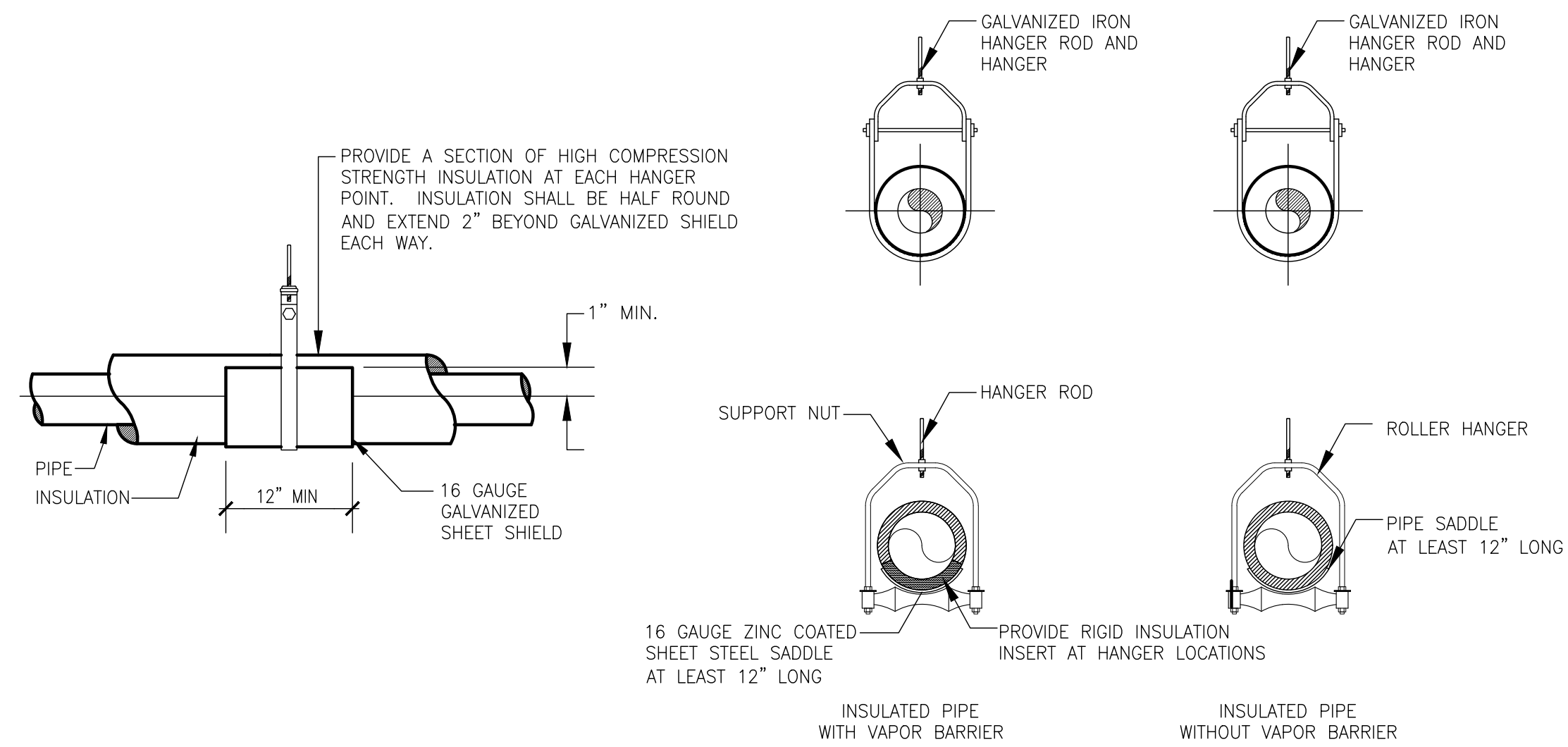
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M1.2

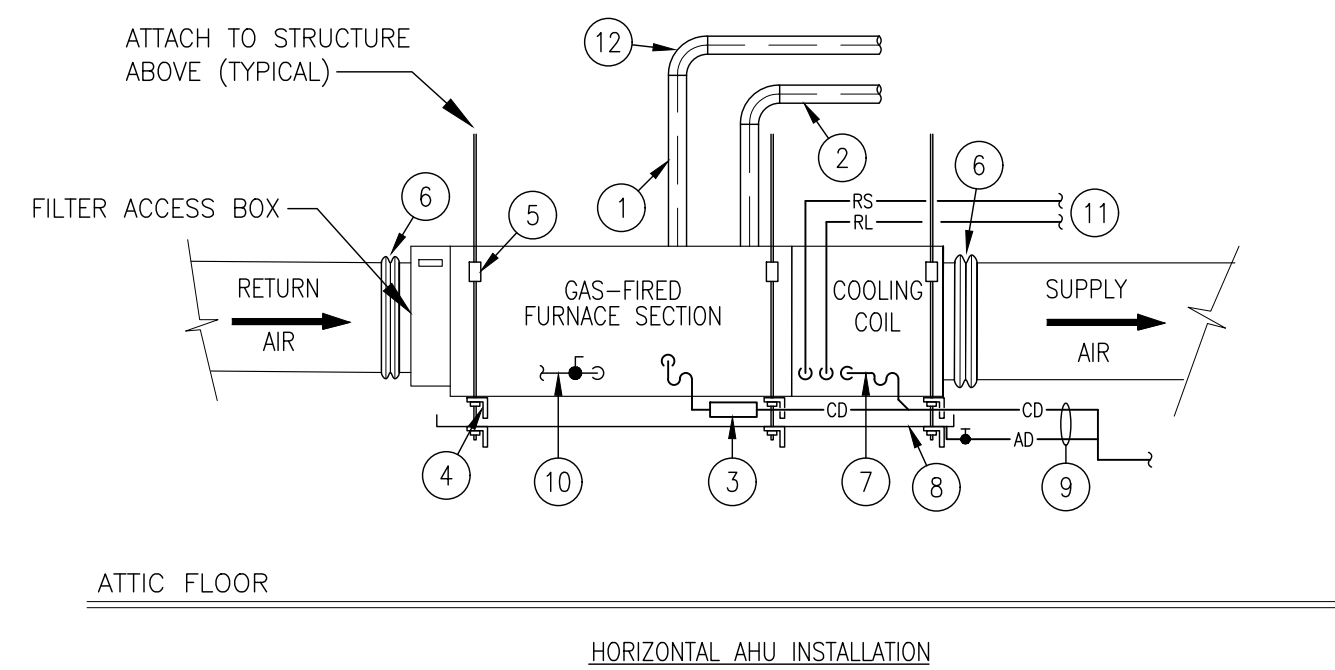


01 DUCTWORK DETAILS
M2.1 NONE



| PIPE SIZE | WEIGHT PER FOOT | MINIMUM HANGER ROD SIZE | MAXIMUM HANGER SPACING | | |
|-----------|-----------------|-------------------------|-----------------------------|---------------|---------------------|
| | | | WASTE & WATER COPPER TYPE M | STEEL SCH. 40 | NATURAL GAS SCH. 40 |
| 1/2" | 1.0 | 1/4" | 6' | 5' | 6' |
| 3/4" | 1.4 | 1/4" | 6' | 6' | 8' |
| 1" | 2.1 | 1/4" | 6' | 7' | 8' |
| 1-1/4" | 2.9 | 3/8" | 6' | 9' | 10' |
| 1-1/2" | 3.6 | 3/8" | 6' | 9' | 10' |
| 2" | 5.2 | 3/8" | 10' | 10' | 10' |
| 2-1/2" | 7.9 | 1/2" | 10' | 11' | 10' |
| 3" | 10.8 | 1/2" | - | 12' | - |
| 4" | 16.5 | 5/8" | - | 14' | - |
| 6" | 31.5 | 3/4" | - | 17' | - |
| 8" | 47 | 7/8" | - | 19' | - |
| 10" | 70 | 7/8" | - | 22' | - |
| 12" | 94 | 7/8" | - | 23' | - |

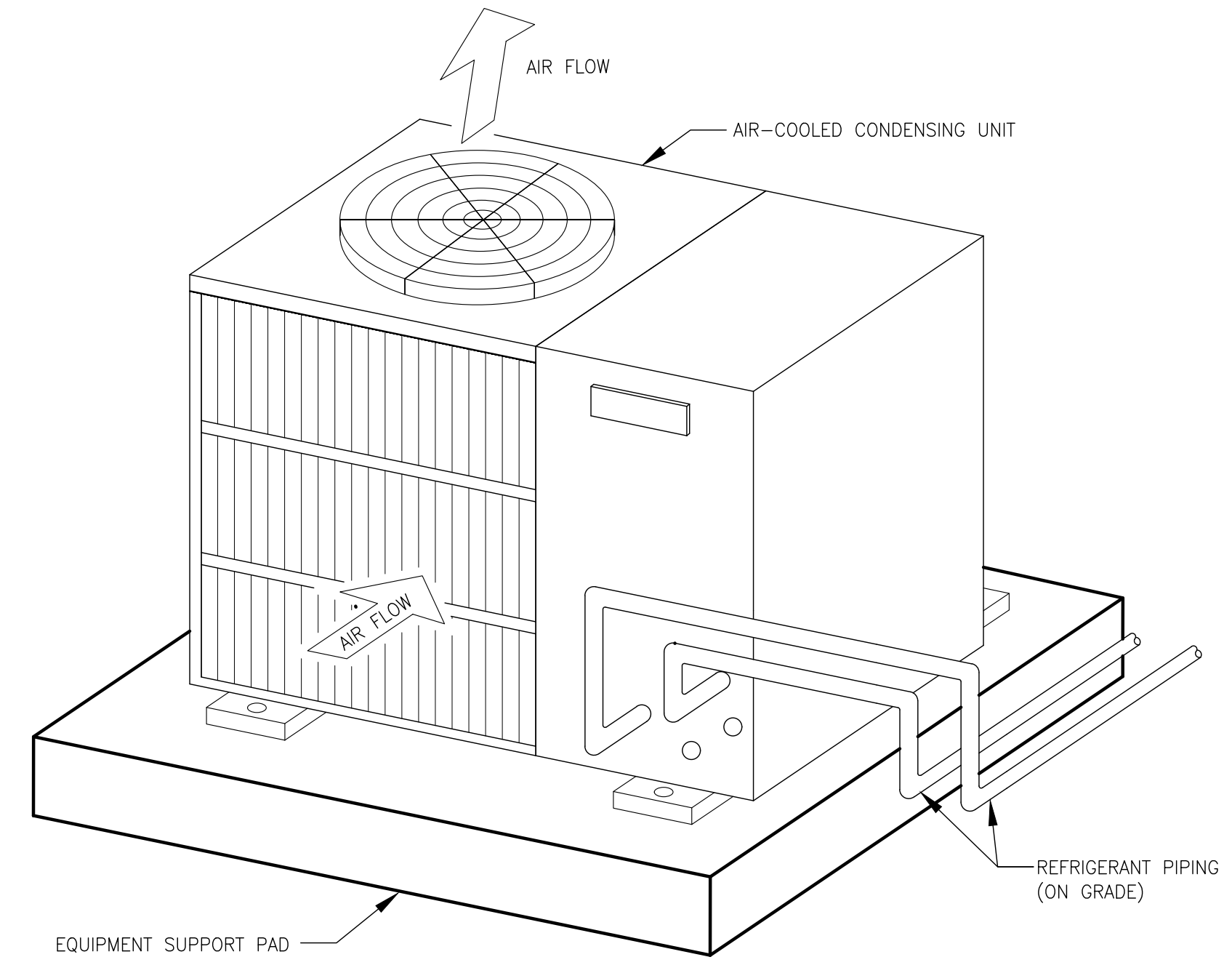
03 PIPE HANGER DETAIL
M2.1 NONE



- GENERAL NOTES
- DETAIL SIMILAR FOR ALL INSTALLATIONS, UNLESS OTHERWISE INDICATED. CONTRACTOR TO ADJUST CONFIGURATION TO SUIT FIELD CONDITIONS.
 - REFER TO FLOOR PLANS FOR DUCT SIZING.
 - AIR SYSTEMS SHALL BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, INCLUDING REFRIGERANT PIPE SIZING & MAXIMUM RUN VENT PIPING.
 - FLOOR PLANS DO NOT INCLUDE ALL REQUIRED DETAILS OF THIS INSTALLATION.
 - MAINTAIN REQUIRED ACCESS FOR MAINTENANCE & CLEARANCE TO COMBUSTIBLES.
 - ALL DUCTS TO UNIT SHALL BE FULL CONNECTION SIZE.

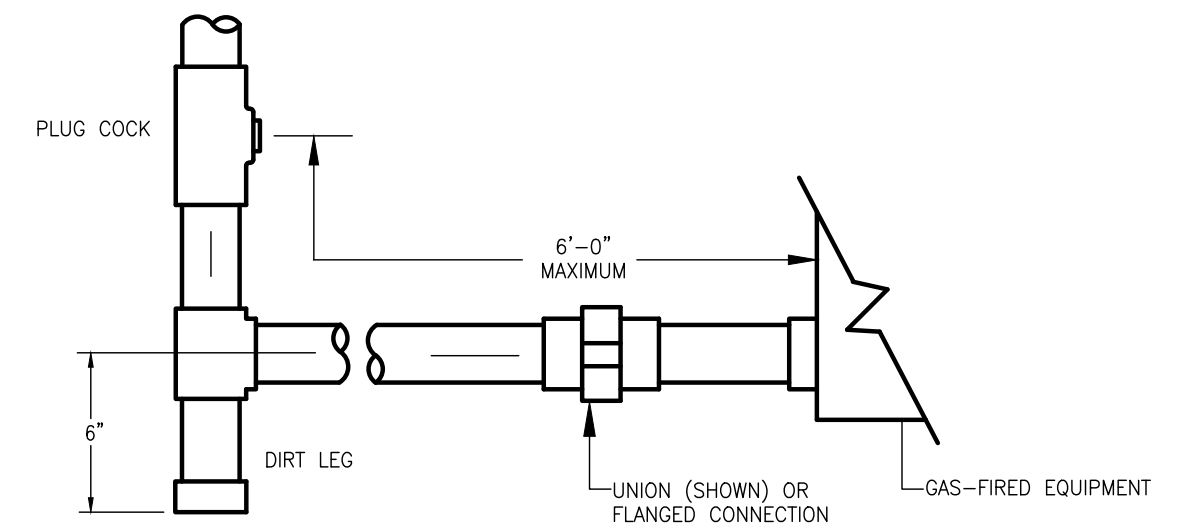
- KEY NOTES
- PVC VENT PIPE.
 - PVC COMBUSTION AIR PIPE.
 - VENT CONDENSATE NEUTRALIZER.
 - EQUIPMENT SUPPORTS.
 - VIBRATION ISOLATION.
 - FLEXIBLE DUCT CONNECTION.
 - CPVC A/C CONDENSATE DRAIN.
 - AUXILIARY DRAIN PAN WITH 1" CPVC PRIMARY AND OVERFLOW PIPING TO INDIRECT WASTE (PER IMC 2018).
 - 1" PVC CONDENSATE DRAIN TO INDIRECT WASTE.
 - NATURAL GAS CONNECTION, REFER TO PLUMBING DRAWINGS.
 - REFRIGERANT PIPING TO ASSOCIATED AIR-COOLED CONDENSING UNIT OUTDOORS.
 - LONG RADIUS ELBOWS, TYPICAL.

05 TYPICAL GAS-FIRED FURNACE W/ DX COOLING COIL SPLIT SYSTEM INSTALLATION SCHEMATIC
M2.1 NONE



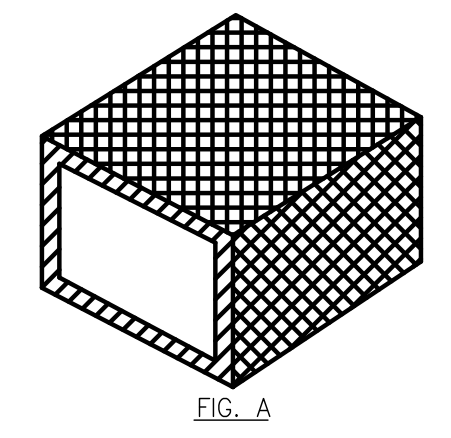
- NOTES:
- CONTRACTOR SHALL SECURE THE UNIT IN ACCORDANCE WITH LOCAL SEISMIC BUILDING CODES.
 - PROVIDE REDUCERS/INCREASERS AS REQUIRED FOR CORRECT CONNECTION TO UNIT.
 - SIZE AND INSTALL ALL REFRIGERANT PIPING AND PROVIDE QUANTITIES AS PER THE MANUFACTURER'S RECOMMENDATIONS (QUANTITIES SHOWN ARE FOR DIAGRAMMATIC PURPOSES).
 - PROVIDE 6" HIGH INTERNALLY REINFORCED CONCRETE EQUIPMENT PAD (GRADE) THAT EXTENDS 6" BEYOND THE PERIMETER OF THE UNIT.

02 AIR COOLED CONDENSING UNIT DETAIL
M2.1 NONE

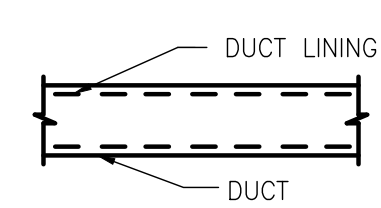
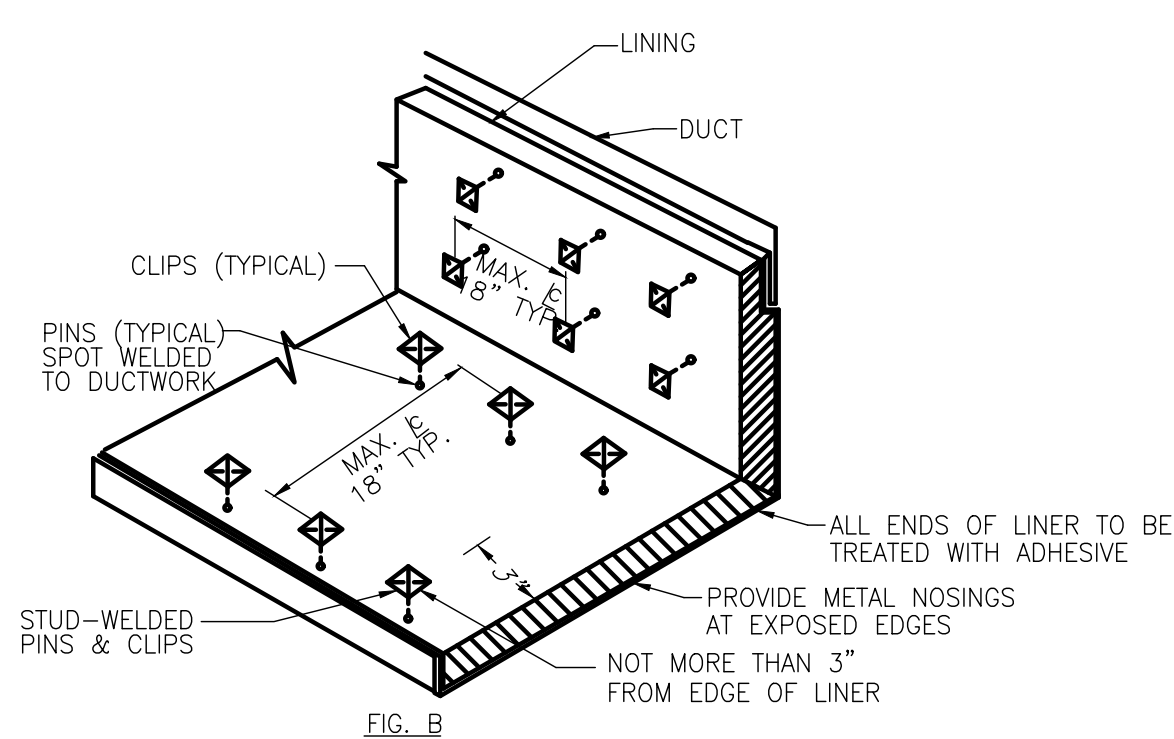


- NOTES:
- SEE PLUMBING FLOOR PLANS AND COORDINATE WITH EQUIPMENT MANUFACTURER FOR SIZES.
 - PROVIDE LOCK-UP TYPE GAS REGULATOR WHERE APPLICABLE TO MAINTAIN RECOMMENDED GAS PRESSURE TO EQUIPMENT SERVING.

04 TYPICAL NATURAL GAS EQUIPMENT CONNECTION
M2.1 NONE



- NOTES:
- DUCTS SHALL BE ACOUSTICALLY LINED ON ALL 4 SIDES AS SHOWN IN FIG. "A" AND SHALL BE DESIGNATED BY THE SYMBOL IN FIG. "C". LINING THICKNESS SHALL BE AS SPECIFIED.
 - DUCTS LINED WITH ACOUSTICAL MATERIAL SHALL BE FASTENED WITH CLIPS, ADHESIVE OR PINS, AS DESCRIBED IN SMACNA DUCT CONSTRUCTION STANDARDS 1985 EDITION.
 - REFER TO SPECIFICATIONS FOR MATERIAL TYPES.
 - PROVIDE LINING FOR A MINIMUM OF 10' AFTER UNIT SUPPLY AND RETURN AIR CONNECTIONS.



06 ACOUSTICAL TREATMENT - DUCT LINING DETAIL
M2.1 NONE



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James Sarno Jr., P.E.
Professional Engineer
State of New Jersey
DATE:
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NUMBER: 451908

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RESTORATION & EXPANSION
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M2.1

| RECTANGULAR DUCT HANGER SCHEDULE (MINIMUM SIZES) | | | | | | | | |
|--|---------------------|-----------------|--------------------|-----------------|--------------------|-----------------|--------------------|-----------------|
| HALF DUCT PERIMETER RANGE | PAIR AT 10' SPACING | | PAIR AT 8' SPACING | | PAIR AT 5' SPACING | | PAIR AT 4' SPACING | |
| | STRAP | WIRE/ROD | STRAP | WIRE/ROD | STRAP | WIRE/ROD | STRAP | WIRE/ROD |
| P/2 < 30" | 1" x 22 GA. | 10 GA. (0.135") | 1" x 22 GA. | 10 GA. (0.135") | 1" x 22 GA. | 12 GA. (0.106") | 1" x 22 GA. | 12 GA. (0.106") |
| P/2 < 72" | 1" x 18 GA. | 3/8" | 1" x 20 GA. | 1/4" | 1" x 22 GA. | 1/4" | 1" x 22 GA. | 1/4" |
| P/2 < 96" | 1" x 16 GA. | 3/8" | 1" x 18 GA. | 3/8" | 1" x 20 GA. | 3/8" | 1" x 22 GA. | 1/4" |
| P/2 < 120" | 1-1/2" x 16 GA. | 1/2" | 1" x 16 GA. | 3/8" | 1" x 18 GA. | 3/8" | 1" x 20 GA. | 1/4" |
| P/2 < 168" | 1-1/2" x 16 GA. | 1/2" | 1" x 16 GA. | 1/2" | 1" x 16 GA. | 3/8" | 1" x 18 GA. | 3/8" |
| P/2 < 192" | - | 1/2" | 1-1/2" x 16 GA. | 1/2" | 1" x 16 GA. | 3/8" | 1" x 16 GA. | 3/8" |

SECURE TO STRUCTURE ABOVE AS RECOMMENDED BY SMACNA

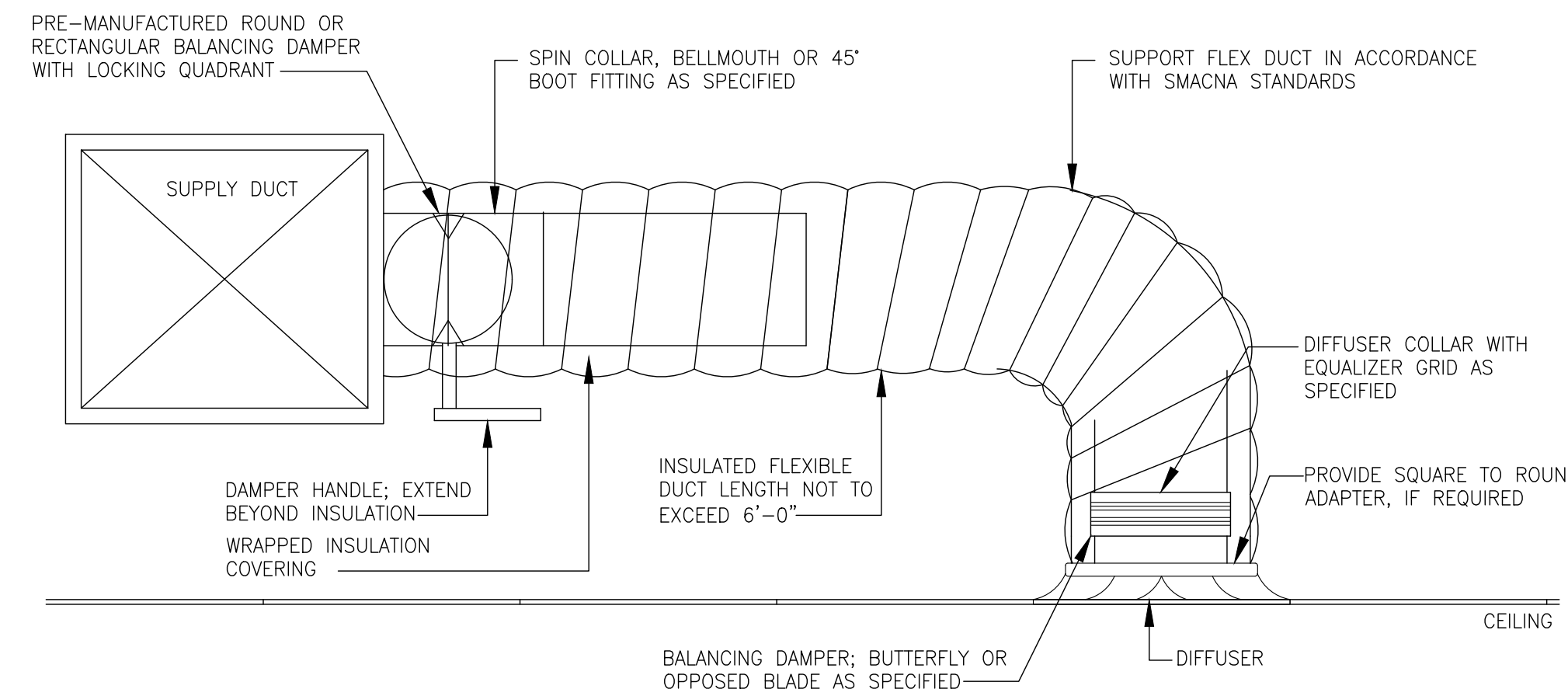
GALVANIZED IRON STRAP OR ALUMINUM STRAP, TURN UNDER DUCT MINIMUM 1". RIVET OR BOLT TO UNDERSIDE OF DUCT

SHEET METAL SCREW, RIVET OR BOLT TO BOTH SIDES OF DUCT

FOR BRACING ANGLES, SEE NOTES

NUT AND WASHER AT END OF ROD

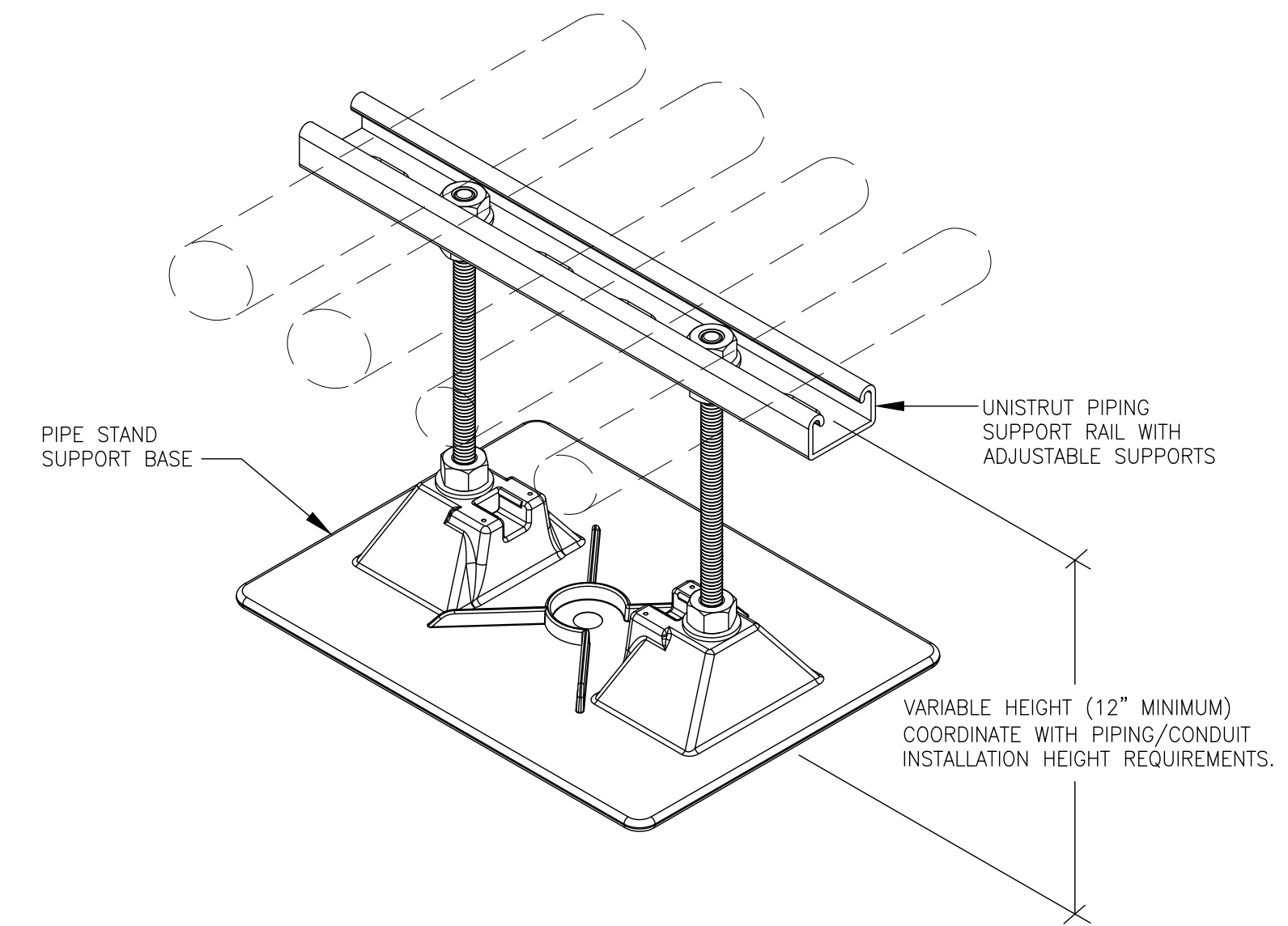
01 DUCT HANGER DETAILS
M2.2 NONE



NOTES:

1. PROVIDE AT FLEXIBLE DUCT CONNECTION A METAL DRAWNBAND ON THE INTERIOR FLEXIBLE DUCT. SECURE THE INSULATION OVER THE DRAW BAND WITH AN ADDITIONAL DRAWNBAND.
2. PROVIDE MINIMUM 2" COLLARS FOR ATTACHMENT OF THE FLEX DUCT TO ROUND DUCT, DAMPERS AND DIFFUSERS.
3. BAND RIGID ROUND DUCT INSULATION TO DUCT AND PROVIDE TAPE FOR INSULATION OVERLAP.

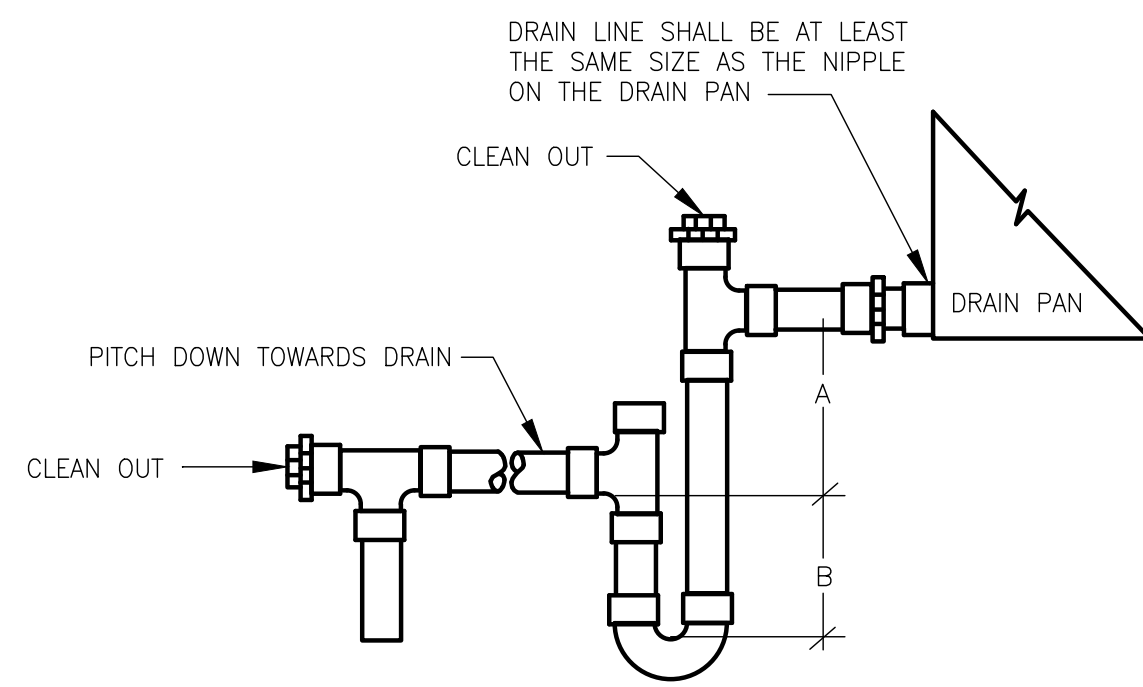
02 FLEXIBLE DUCT INSTALLATION
M2.2 NONE



NOTES:

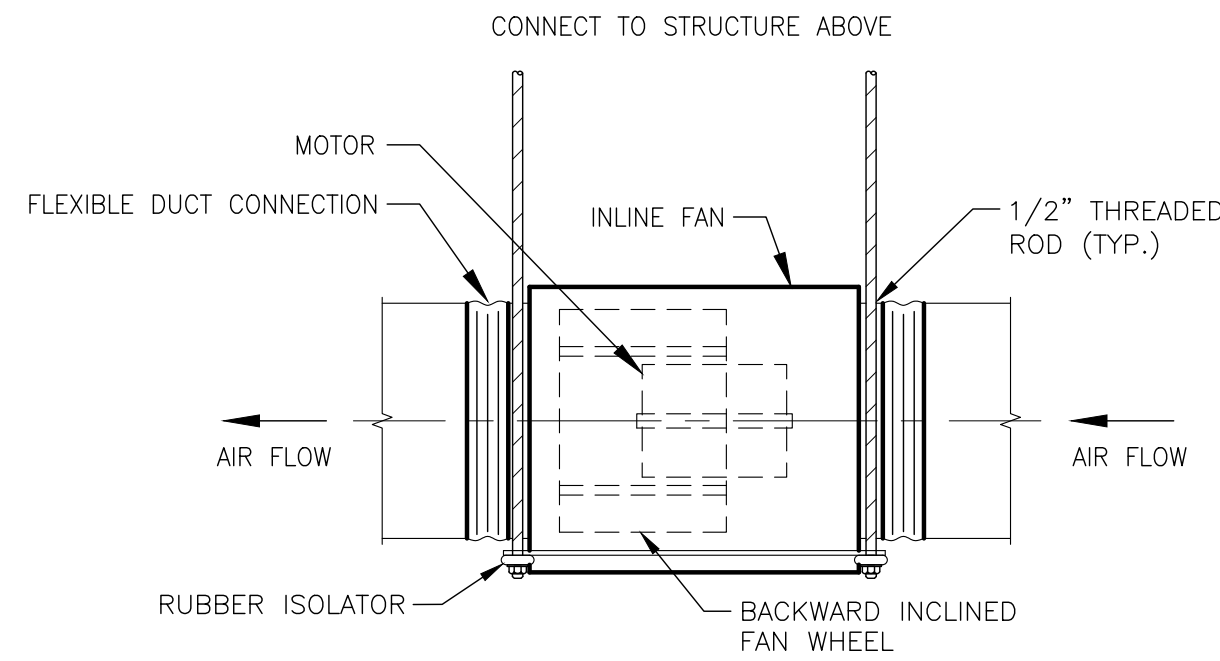
1. REFRIGERANT PIPING / CONDUIT PRE-MANUFACTURED SUPPORT BY MIRO INDUSTRIES MODEL 2.5-12 OR APPROVED EQUAL.
2. ALL PARTS SHALL BE HOT-DIPPED GALVANIZED AND / OR STAINLESS STEEL.
3. CONTRACTOR SHALL SECURE ALL CONDUIT AND PIPING TO UNISTRUT SUPPORT WITH GALVANIZED PIPE CLAMPS. PIPE CLAMPS SHALL BE SIZED PROPERLY TO ACCOMMODATE PIPING INSULATION, NOT ALLOWING THE PIPING TO REST DIRECTLY ON THE UNISTRUT SUPPORT RAIL.
4. PIPE SUPPORT BASE SHALL BE POLYCARBONATE RESIN.
5. PROVIDE PIPING / CONDUIT SUPPORTS EVERY 3'-0". PIPING SUPPORT SHALL BE SIZED TO ACCOMMODATE MULTIPLE PIPES / CONDUIT WHILE MAINTAINING THE SUPPORT WEIGHT LIMITS. PROVIDE EXTRA SUPPORTS TO DECREASE WEIGHT CAPACITIES AND PREVENT "SAGGING" WHERE REQUIRED.

03 PIPE SUPPORT DETAIL
M2.2 NONE



UNIT TYPE A B
DRAW THRU X" 1.5X"
BLOW THRU 1"MIN 2X
WHERE X = STATIC PRESSURE IN PAN

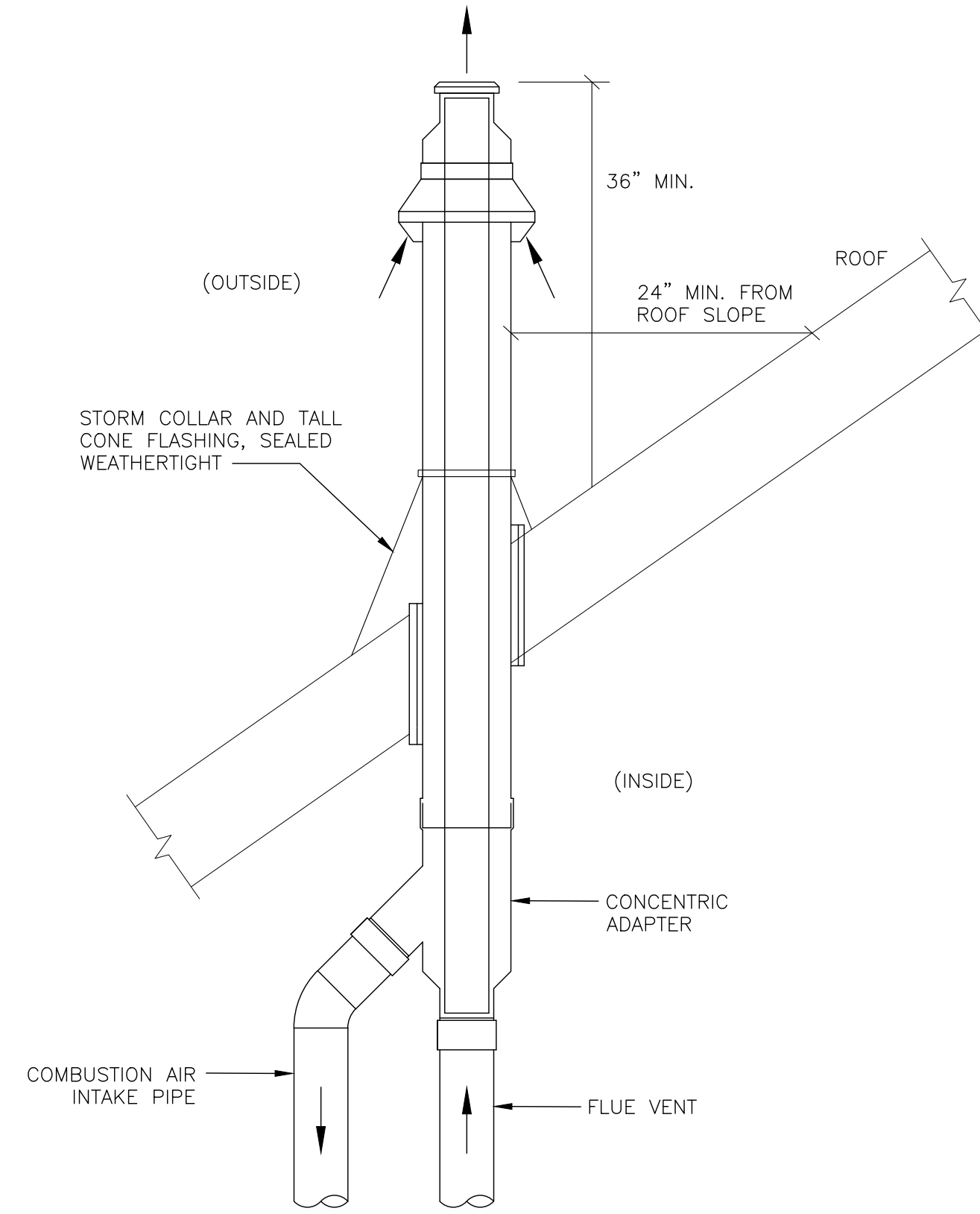
04 CONDENSATE DRAIN TRAP DETAIL
M2.2 NONE



NOTES:

1. PROVIDE VIBRATION ISOLATION IN FAN SUPPORTS.
2. TRANSITION FROM FULL UNIT DUCT CONNECTION SIZE TO DUCT SIZES AS SHOWN ON FLOOR PLANS AS REQUIRED.
3. SEE SCHEDULE FOR MORE INFORMATION.

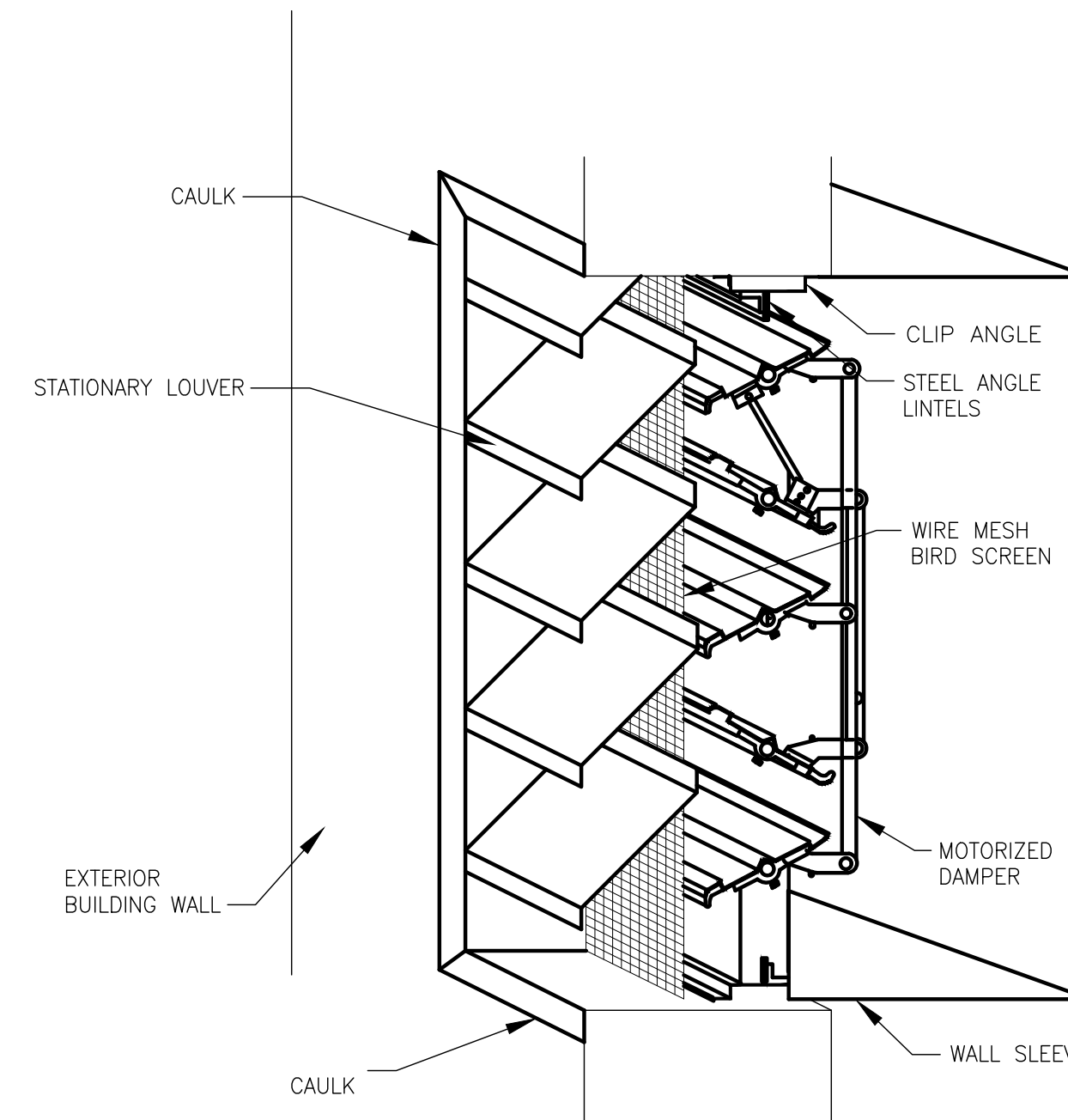
05 INLINE EXHAUST FAN DETAIL
M2.2 NONE



NOTES:

1. PROVIDE HEAT RESISTANT SILICONE SEALANT AT ROOF PENETRATION.
2. ALL HARDWARE SHALL BE CORROSIVE RESISTANT.
3. PITCH EXHAUST PIPING SLIGHTLY AWAY FROM CONNECTED AIR HANDLING UNIT TO DRAIN POTENTIAL CONDENSATE FORMATION.
4. PROVIDE SEALED JOINTS (POSITIVE PRESSURE) FLUE VENT AND COMBUSTION AIR INTAKE SCHEDULE 40 PVC PIPING. COORDINATE PIPING TYPE AND INSTALLATION WITH MANUFACTURER'S RECOMMENDATIONS. SEE FLOOR PLANS AND SCHEDULE FOR SIZES.
5. COORDINATE ROOF PENETRATION TYPE WITH ROOF SLOPE AS REQUIRED.
6. PAINT PIPING TO MATCH ROOF WITH SUITABLE PAINT FOR MATERIAL BEING PAINTED. COORDINATE WITH ARCHITECT FOR COLOR.

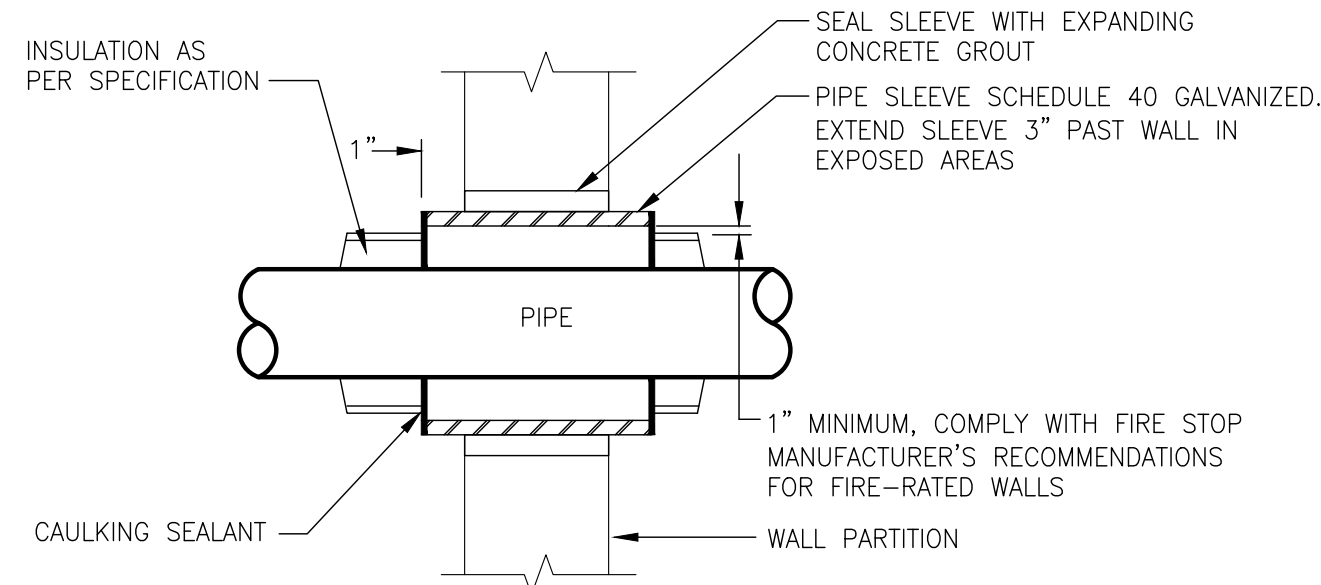
07 COMBINATION FLUE / COMBUSTION AIR INSTALLATION THRU ROOF DETAIL
M2.2 NONE



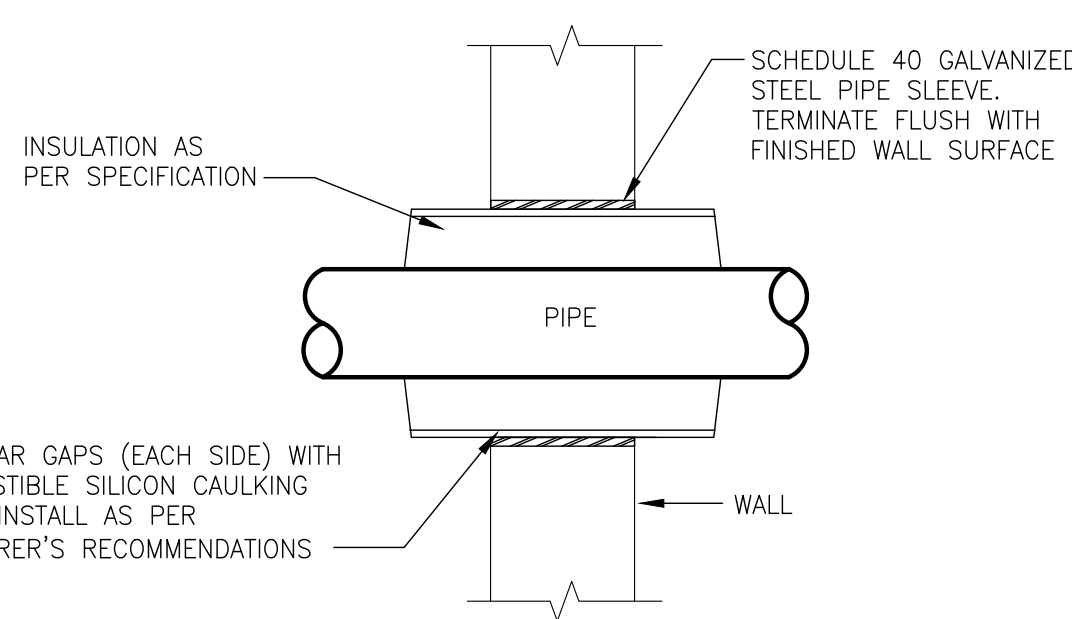
NOTES:

1. OVERALL SIZE OF OPENING SHOULD BE 1/4" GREATER IN BOTH DIRECTIONS THAN SIZE OF LOUVER.
2. LOUVER BLADES SHOULD NOT EXCEED 5 FT. IN WIDTH. USE MULLION CONNECTED SECTIONS FOR GREATER WIDTHS.
3. PROVIDE CAULKING SEALANT, SINGLE COMPONENT, NEUTRAL CURING, NON-SAG TYPE, CLASS 100/50. SEALANT COLOR TO MATCH EXTERIOR FINISHES. COORDINATE CAULK TYPE CAPABILITY WITH WALL CONSTRUCTION PRIOR TO USE.
4. PROVIDE MOTOR OPERATED DAMPER (MOD) INTERLOCKED WITH EQUIPMENT OPERATION LOUVER IS SERVING.

08 AIR LOUVER INSTALLATION DETAIL
M2.2 NONE



PIPING PENETRATION METHOD FOR MASONRY AND FIRE-RATED WALLS

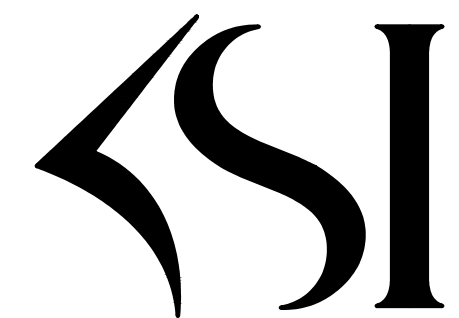


PIPING PENETRATION METHOD FOR GYPSUM BOARD WALLS

NOTES:

1. DETAIL SHALL BE APPLIED TO ALL WALL (CORRIDOR, STAIRWELLS, UTILITY ROOMS, ETC.) PIPING PENETRATIONS.
2. PROVIDE ESCUTCHEON PLATE WHERE PIPE PENETRATIONS ARE EXPOSED IN FINISHED AREAS.
3. PROVIDE 3M F.S. WRAPSTRIP FIRE STOP AND C.P. 25 CAULKING PUTTY INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS TO ANY FIRE-RATED WALL PENETRATIONS.

06 PIPE PENETRATION THROUGH WALL
M2.2 NONE



KSI CONSULTING ENGINEERS, LLC
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James Sarno, Jr., P.E.
Professional Engineer
State of New Jersey

DATE:
NEW JERSEY PROFESSIONAL ENGINEER
LICENSE NUMBER: 451500

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PROJECT No.: 1836C
DATE: 30 JUNE 2021
REVISIONS:

DRAWN BY: JGP

RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
TOWNSHIP OF PISCATAWAY
MIDDLESEX COUNTY, NEW JERSEY

M2.2

| AIR HANDLING UNIT SCHEDULE (AHU) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------------|--|------------------------|------------------|--------------|-------------|----------|-------------------------|-----------|----------|--------------|-------------------|---------------|---------------------|---------|-------------------|----------|----------|-------|------------|-------|------|---------------------|-------|------|--------------|-------------|-------------|
| UNIT ID | MODEL NO. | AREA SERVED | SUPPLY FAN | | | | DX COOLING COIL | | | | GAS-FIRED HEATING | | | | ELECTRICAL | | | | DIMENSIONS | | | OPER. WEIGHT (LBS.) | NOTES | | | | |
| | | | TOTAL SUPPLY CFM | TOTAL OA CFM | ESP IN. WG. | MOTOR HP | NOMINAL CAPACITY (TONS) | TOTAL MBH | SENS MBH | EAT DB/WB °F | LAT DB/WB °F | GAS INPUT MBH | GAS OUTPUT HIGH MBH | LOW MBH | AFUE EFFICIENCY % | EAT DB°F | LAT DB°F | VOLTS | PHASE | HERTZ | MCA | | | MOCP | HEIGHT (IN.) | DEPTH (IN.) | WIDTH (IN.) |
| AHU-1 | 59MN7B080C21-20 (FURNACE) / CNPHP4821ALA (DX COIL) | GALLERY AREA | 1,500 | 455 | 0.50 | 1.00 | 4.0 | 43.3 | 31.4 | 80/67 | 56.3/55.8 | 80.0 | 78.0 | 31.0 | 97.2 | 48.8 | 96.8 | 115 | 1 | 60 | 18.4 | 25 | 35.0 | 29.5 | 21.0 | 170 | 1 THRU 19 |
| AHU-2 | 59MN7B080C21-20 (FURNACE) / CNPHP4821ALA (DX COIL) | GALLERY AREA | 1,500 | 455 | 0.50 | 1.00 | 4.0 | 43.3 | 31.4 | 80/67 | 56.3/55.8 | 80.0 | 78.0 | 31.0 | 97.2 | 48.8 | 96.8 | 115 | 1 | 60 | 18.4 | 25 | 35.0 | 29.5 | 21.0 | 170 | 1 THRU 19 |
| AHU-3 | 59MN7B080C21-20 (FURNACE) / CNPHP4821ALA (DX COIL) | GALLERY AREA / KITCHEN | 1,500 | 455 | 0.50 | 1.00 | 4.0 | 43.3 | 31.4 | 80/67 | 56.3/55.8 | 80.0 | 78.0 | 31.0 | 97.2 | 48.8 | 96.8 | 115 | 1 | 60 | 18.4 | 25 | 35.0 | 29.5 | 21.0 | 170 | 1 THRU 19 |

NOTES:
1. SELECTIONS BASED ON EQUIPMENT MANUFACTURED BY CARRIER "INFINITY SERIES" OR APPROVED EQUAL.
2. CONTRACTOR TO COORDINATE HEATING FURNACE AND COOLING SPLIT SYSTEM SIZE, TYPE, ETC. FOR PROPER MATING / COMPATIBILITY WITH MANUFACTURER PRIOR TO ORDERING.
3. CONTRACTOR TO COORDINATE PROPER CONFIGURATION (HORIZONTAL VS. VERTICAL, DUCT CONNECTION LOCATIONS, ETC.) BASED ON DRAWINGS WITH THE MANUFACTURER PRIOR TO ORDERING.
4. UNIT SHALL HAVE VARIABLE SPEED ECM BLOWER MOTOR.
5. UNIT SHALL HAVE REMOTE FACTORY DIGITAL 7-DAY PROGRAMMABLE THERMOSTAT WITH INTERFACE TOUCH-SCREEN AND WIFI. CONTROLLER SHALL HAVE OCCUPIED / UNOCCUPIED SCHEDULING MODES, TEMPERATURE SETPOINT ADJUSTMENT, HUMIDITY SENSING WITH CONTROL OVERRIDES, ETC. CAPABILITIES.
6. UNIT SHALL HAVE "GREENSPEED INTELLIGENCE" CONTROLS AND MONITORING OF CRITICAL SYSTEM PARAMETERS FOR TEMPERATURE AND HUMIDITY CONTROL.
7. STATIC PRESSURE INDICATED ABOVE IS THE EXTERNAL STATIC PRESSURE WHICH EXCLUDES ANY PRESSURE DROPS WITHIN THE UNIT.
8. UNITS SHALL BE COMPLETE WITH SIDE CONDENSATE OUTLET DRAIN PIPED THROUGH P-TRAP.
9. EVAPORATOR COIL SHALL BE INTERTWINED WITH COPPER/ALUMINUM TUBES AND ALUMINUM FINS.
10. MAXIMUM AIR VELOCITY THRU COOLING COIL SHALL NOT EXCEED 500 FEET PER MINUTE.
11. ELECTRICAL CONNECTION TO BE SINGLE POINT PROVIDED WITH DISCONNECT SWITCH.
12. UNIT SHALL BE RATED AT 95°F HIGH AMBIENT TEMPERATURE AND 0°F LOW AMBIENT TEMPERATURE RANGE.
13. PROVIDE CONDENSATE PUMP WITH CHECK VALVE.
14. PROVIDE FILTER BOX WITH PLEATED MERV 8 FILTER WITH DIRTY FILTER ALARM.
15. PROVIDE FREEZE PROTECTION SENSOR.
16. UNIT SHALL HAVE NON-CORROSIVE STEEL GAS-FIRED HEAT EXCHANGER.
17. PROVIDE BOILER VENT CONDENSATION NEUTRALIZATION KIT.
18. UNIT SHALL HAVE FULL MODULATING GAS-FIRED HEATING WITH INTEGRAL SAFETY DEVICES.
19. UNIT SHALL BE SEALED-COMBUSTION WITH FACTORY CONCENTRIC ADAPTER FOR SINGLE FLUE VENT AND COMBUSTION AIR INTAKE EXTERIOR PENETRATION.

| AIR-COOLED CONDENSING UNIT SCHEDULE (ACCU) | | | | | | | | | | | | | | | |
|--|-----------|----------------------------|---------------------------------|----------------|------------|-------|-------|------------|-------------|---------------|------|---------------|-------|--------------|--------------|
| UNIT NO. | MODEL NO. | INTERLOCKED INDOOR UNIT(S) | NOMINAL COOLING CAPACITY (TONS) | CAPACITY (MBH) | ELECTRICAL | | | DIMENSIONS | | | SEER | WEIGHT (LBS.) | NOTES | | |
| | | | | | VOLTS | PHASE | HERTZ | MCA (AMPS) | MOCP (AMPS) | HEIGHT (INCH) | | | | WIDTH (INCH) | DEPTH (INCH) |
| ACCU-1 | 24VNA048A | AHU-1 | 4.0 | 48.0 | 208 | 1 | 60 | 35.0 | 50 | 43.8 | 35.0 | 35.0 | 20.5 | 325 | 1 THRU 11 |
| ACCU-2 | 24VNA048A | AHU-2 | 4.0 | 48.0 | 208 | 1 | 60 | 35.0 | 50 | 43.8 | 35.0 | 35.0 | 20.5 | 325 | 1 THRU 11 |
| ACCU-3 | 24VNA048A | AHU-3 | 4.0 | 48.0 | 208 | 1 | 60 | 35.0 | 50 | 43.8 | 35.0 | 35.0 | 20.5 | 325 | 1 THRU 11 |

NOTES:
1. SELECTIONS BASED ON EQUIPMENT MANUFACTURED BY CARRIER "INFINITY SERIES" OR APPROVED EQUAL.
2. PROVIDE POWER NON-FUSED DISCONNECT SWITCH AND CONDENSER COIL GUARD.
3. PROVIDE AND COORDINATE ALL REQUIRED FACTORY INSTALLATION HARDWARE WITH MANUFACTURER.
4. UNIT SHALL HAVE "INFINITY WALL CONTROL" LOW AMBIENT COOLING DOWN TO 0°F.
5. UNIT SHALL HAVE OVERHEAT (THERMAL SWITCH), OVERCURRENT, HIGH/LOW PRESSURE AND EVAPORATOR FREEZE PROTECTION.
6. UNIT SHALL HAVE CRANKCASE HEATER, SUCTION PRESSURE TRANSDUCER, FILTER DRYER AND WINTER START CONTROL.
7. UNIT SELECTION BASED ON 95°F AMBIENT AIR CONDITIONS.
8. UNIT SHALL USE PURON REFRIGERANT (R-410A).
9. UNIT SHALL HAVE "GREENSPEED INTELLIGENCE" CONTROLS AND MONITORING OF CRITICAL SYSTEM PARAMETERS FOR TEMPERATURE AND HUMIDITY CONTROL.
10. UNIT SHALL HAVE VARIABLE SPEED SCROLL COMPRESSOR WITH SOUND BLANKET.
11. PROVIDE ALL NECESSARY FACTORY CONTROLS TO INTERLOCK UNIT OPERATION WITH ASSOCIATED AHU.

| DIFFUSER AND REGISTER SCHEDULE | | | | | NOTES |
|--------------------------------|--------|---------------|---|--|-------------|
| UNIT ID | MODEL | SIZE | DESCRIPTION | | |
| A | ASCD | 20"X20" | ALUMINUM SQUARE SUPPLY DIFFUSER, 3 CONE, ADJUSTABLE AIR PATTERN, DAMPER. | | 1,2,3,4,5,6 |
| B | ASCD | 12"X12" | ALUMINUM SQUARE SUPPLY DIFFUSER, 3 CONE, ADJUSTABLE AIR PATTERN, DAMPER. | | 1,2,3,4,5,6 |
| C | 5300 | 20"X20" | STEEL RETURN/EXHAUST GRILLE, 45° DEFLECTION LOUVER BLADES, 3/4" BLADE SPACING, DAMPER | | 1,2,3,4,6 |
| D | SDS100 | 48"L / 8 SLOT | ALUMINUM LINEAR SLOT DIFFUSER, 1" SLOTS, ADJUSTABLE AIRFOIL BLADES, DAMPER | | 1,2,3,4,6 |

NOTES:
1. SELECTIONS BASED ON EQUIPMENT MANUFACTURED BY PRICE HVAC OR APPROVED EQUAL.
2. MAXIMUM NOISE CRITERION RATING < 25 DBA.
3. BAKED ENAMEL FINISH, COLOR TO BE SELECTED BY ARCHITECT.
4. MOUNTING FRAME TYPE SHALL BE COORDINATED WITH CEILING / WALL / FLOOR / DUCT CONSTRUCTION TYPE.
5. NECK DIAMETER SHALL BE AS SCHEDULED. SEE NECK SIZE TABLE.
6. UNLESS OTHERWISE INDICATED ON PLANS, BALANCING DAMPER TO BE INSTALLED IN NECK OF DIFFUSER OR RETURN.

NECK SIZE TABLE
UP TO 100 CFM - 6" DIAMETER
100 TO 275 CFM - 8" DIAMETER
276 TO 380 CFM - 10" DIAMETER
381 TO 500 CFM - 12" DIAMETER
501 TO 700 CFM - 14" DIAMETER
701 TO 901 CFM - 15" DIAMETER

| FAN SCHEDULE (EF) | | | | | | | | | | | | | | | | |
|-------------------|--------------|--------|----------------------------|----------|---------|-----|-------------|--------|-------|-------|-------|-------|------|---------------|-------|----------|
| UNIT ID | MODEL NUMBER | TYPE | EQUIPMENT INTERLOCKED WITH | LOCATION | SERVING | CFM | SP IN. W.G. | DRIVE | MOTOR | | | | MOCP | WEIGHT (LBS.) | NOTES | |
| | | | | | | | | | HP | VOLTS | PHASE | HERTZ | | | | AMPS |
| EF-1 | S095D | INLINE | AHU-2, MOD | ATTIC | GALLERY | 455 | 0.42 | DIRECT | 1/8 | 115 | 1 | 60 | 5.2 | 15.0 | 41 | 1 THRU 5 |
| EF-2 | S095D | INLINE | AHU-2, MOD | ATTIC | GALLERY | 455 | 0.42 | DIRECT | 1/8 | 115 | 1 | 60 | 5.2 | 15.0 | 41 | 1 THRU 5 |
| EF-3 | S095D | INLINE | AHU-2, MOD | ATTIC | GALLERY | 455 | 0.42 | DIRECT | 1/8 | 115 | 1 | 60 | 5.2 | 15.0 | 41 | 1 THRU 5 |

NOTES:
1. SELECTIONS BASED ON GREENHECK OR APPROVED EQUAL.
2. PROVIDE DISCONNECT SWITCH.
3. FAN SHALL BE DIRECT DRIVE WITH FACTORY SPEED CONTROLLER MOUNTED ON FAN.
4. FAN SHALL HAVE INTEGRAL BACKDRAFT DAMPER.
5. PROVIDE MOTOR OPERATED DAMPER (MOD) AT LOUVER CONNECTION INTERLOCKED WITH FAN OPERATION.

| ELECTRIC HEATER SCHEDULE (EWH) | | | | | | | | | | | | | | | |
|--------------------------------|-------------|--------------|--------------|--------------|------------|-------|-------|-------|------------|------|-------------|--------------|-------|--------------|-------------|
| UNIT ID | MODEL NO. | LOCATION | CAPACITY MBH | AIR FLOW CFM | ELECTRICAL | | | | DIMENSIONS | | | WEIGHT (LBS) | NOTES | | |
| | | | | | KW | VOLTS | PHASE | HERTZ | MCA | MOCP | WIDTH (IN.) | | | HEIGHT (IN.) | DEPTH (IN.) |
| EWH-1 | CWH1151DSAG | UTILITY ROOM | 5.1 | 100 | 1.5 | 120 | 1 | 60 | 12.5 | 20.0 | 15.8 | 19.2 | 3.8 | 20 | 1 THRU 7 |

NOTES:
1. SELECTIONS BASED ON EQUIPMENT MANUFACTURED BY QMARK OR APPROVED EQUAL.
2. PROVIDE TAMPERPROOF INTEGRAL THERMOSTAT.
3. PROVIDE DISCONNECT SWITCH.
4. UNIT SHALL HAVE THERMAL OVERLOAD PROTECTION.
5. PROVIDE ALL FACTORY WALL MOUNTING ACCESSORIES.
6. HEATER SHALL FACTORY HEAVY DUTY TYPE FRONT GRILLE.
7. UNIT SHALL BE SEMI-RECESSED TYPE MOUNTING (COORDINATE WITH WALL DEPTH).

01 MECHANICAL EQUIPMENT SCHEDULES
M3.1 NONE

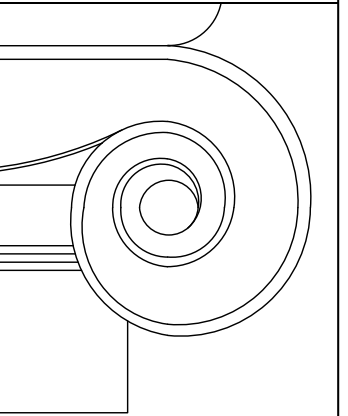
| ROOM VENTILATION SCHEDULE (AHU-1&2) | | | | | | | | | | | | | | | | | |
|-------------------------------------|--------------------|----------|----------------------|--------|-----------------------|--------|--------------------|------|----------------------|-------|----------|-----|------------------------|-----------------------------|-------------------------------|-------|-----------|
| UNIT ID | ROOM NAME | ROOM NO. | RP (OA CFM / PERSON) | | PZ (NUMBER OF PEOPLE) | | RA (OA CFM / SQFT) | | AZ (FLOOR AREA SQFT) | | VZ (CFM) | | VOT (CORRECTED OA CFM) | ACTUAL OA (PROVIDED OA CFM) | EXHAUST AIR (REQUIRED EA CFM) | NOTES | |
| | | | OA CFM | PERSON | NUMBER | PEOPLE | OA CFM | SQFT | FLOOR AREA | SQFT | CFM | EZ | | | | | VOZ (CFM) |
| AHU-1&2 | LARGE GALLERY AREA | N/A | 7.5 | 7.5 | 75 | 75 | 0.06 | 0.06 | 1,161 | 1,161 | 632 | 0.8 | 790 | | | 1 | |
| TOTALS | | | | | | | | | | | | | | | | | 2,3 |

NOTES:
1. 2018 INTERNATIONAL MECHANICAL CODE (IMC) IS USED TO DETERMINE VENTILATION RATES.
2. OUTDOOR AIR REQUIRED IS PROVIDED BY 50% PER HVAC UNIT SERVING THE SAME SPACE.
3. ALL OUTDOOR AIR PROVIDED BY THIS SYSTEM TO THE SPACE IS EXHAUSTED THROUGH INDEPENDENT EXHAUST FANS.

| ROOM VENTILATION SCHEDULE (AHU-3) | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------|--------------------|----------|----------------------|--------|-----------------------|--------|--------------------|------|----------------------|------|----------|-----|-----------|-----------|---------------------------------|----|----|----|---|--------------------------|------------------------|-----------------------------|-------|---|
| UNIT ID | ROOM NAME | ROOM NO. | RP (OA CFM / PERSON) | | PZ (NUMBER OF PEOPLE) | | RA (OA CFM / SQFT) | | AZ (FLOOR AREA SQFT) | | VZ (CFM) | | VOZ (CFM) | | VPZ (ZONE SUPPLY AIR) (MIN CFM) | ZP | EV | PS | D | VOU UNCORRECTED (OA CFM) | VOT (CORRECTED OA CFM) | ACTUAL OA (PROVIDED OA CFM) | NOTES | |
| | | | OA CFM | PERSON | NUMBER | PEOPLE | OA CFM | SQFT | FLOOR AREA | SQFT | CFM | EZ | VOZ (CFM) | VPZ (CFM) | | | | | | | | | | |
| AHU-3 | SMALL GALLERY AREA | N/A | 7.5 | 7.5 | 2 | 2 | 0.06 | 0.06 | 320 | 320 | 169 | 0.8 | 212 | 1,020 | 0.21 | | | | | | | | 1 | |
| | KITCHEN | N/A | 0 | 0 | 2 | 2 | 0.7 | 0.7 | 190 | 190 | 133 | 0.8 | 166 | 380 | 0.44 | | | | | | | | 1 | |
| | CLOSET | N/A | 0 | 0 | 0 | 0 | 0.12 | 0.12 | 35 | 35 | 4 | 0.8 | 5 | 50 | 0.11 | | | | | | | | 1 | |
| | UTILITY ROOM | N/A | 0 | 0 | 0 | 0 | 0.12 | 0.12 | 35 | 35 | 4 | 0.8 | 5 | 50 | 0.11 | | | | | | | | 1 | |
| TOTALS | | | | | | | | | | | | | | | | | | | | | | | | 2 |

NOTES:
1. 2018 INTERNATIONAL MECHANICAL CODE (IMC) IS USED TO DETERMINE VENTILATION RATES.
2. ALL OUTDOOR AIR PROVIDED BY THIS SYSTEM TO THE SPACE IS EXHAUSTED THROUGH INDEPENDENT EXHAUST FANS.

02 MECHANICAL VENTILATION SCHEDULES
M3.1 NONE



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James Sarro Jr., P.E.
Professional Engineer
State of New Jersey

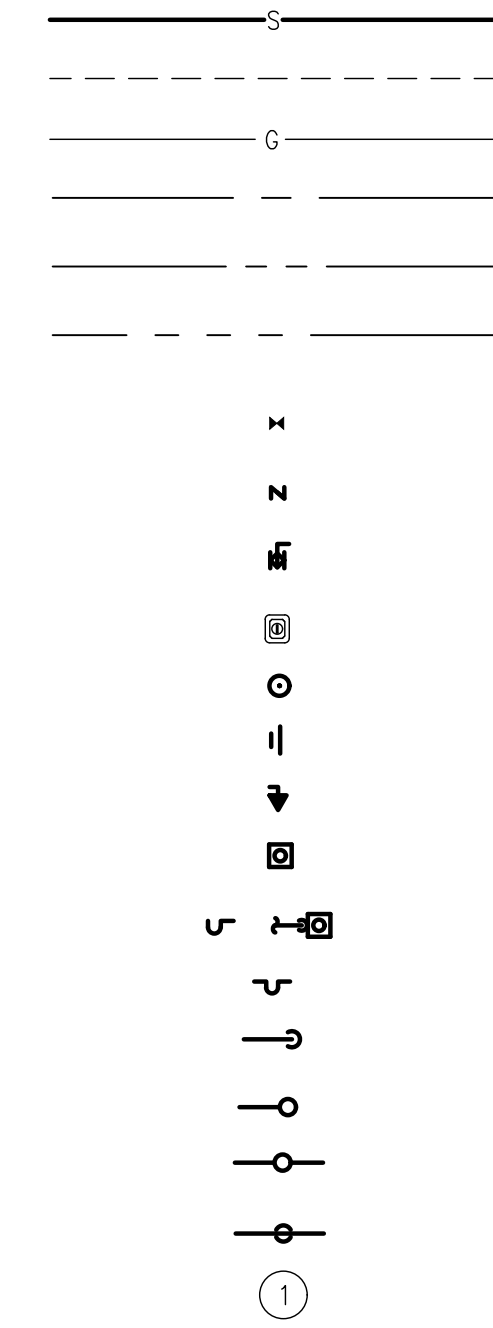
DATE:
NEW JERSEY PROFESSIONAL ENGINEER LICENSE NUMBER: 451590

M3.1

PLUMBING GENERAL NOTES

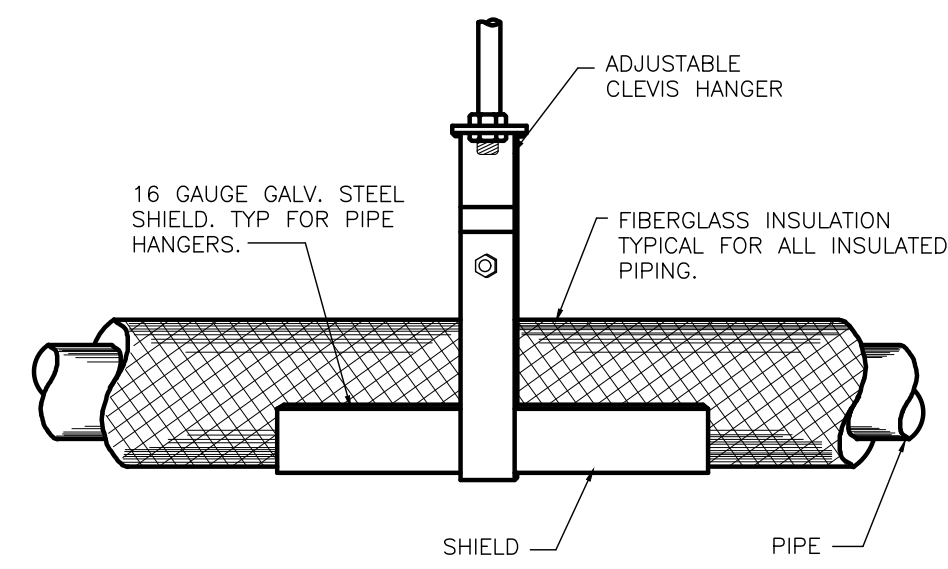
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- DO NOT MAKE ANY CHANGES OR SUBSTITUTIONS WITHOUT SPECIFIC WRITTEN APPROVAL FROM THE ARCHITECT OR ENGINEER.
- ALL INDICATED WORK SHALL BE PERFORMED BY THE PLUMBING CONTRACTOR UNLESS OTHERWISE NOTED.
- PROVIDE C.O.'S AT THE BASE OF ALL SANITARY AND STORM STACKS.
- IT IS THE RESPONSIBILITY OF THE PLUMBING CONTRACTOR TO REVIEW THESE PLANS AND SPECIFICATIONS, AS WELL AS THE RELATED HVAC, FIRE PROTECTION, ELECTRICAL, STRUCTURAL, ARCHITECTURAL, INTERIOR DECOR AND SITE ENGINEERING DRAWING TO BECOME FAMILIAR WITH THE FULL PROJECT SCOPE. IN ADDITION, THIS CONTRACTOR MUST COORDINATE WITH AN OWNER REPRESENTATIVE TO FULLY UNDERSTAND ALL REQUIREMENTS WHICH MAY NOT BE SPECIFIED HEREIN AND WHICH THE OWNER MAY CONSIDER PART OF THIS CONTRACT. DURING THE COURSE OF CONSTRUCTION COORDINATION AND ACTUAL CONSTRUCTION, IT IS THE RESPONSIBILITY OF THE PLUMBING CONTRACTOR TO WORK CLOSELY WITH ALL ACCOMPANYING CONTRACTORS AND TRADESMEN IN ORDER TO ENSURE A SMOOTH RUNNING AND CAREFULLY COORDINATED INSTALLATION.
- ANY DISCREPANCIES OR INADEQUACIES WITHIN THESE BID DOCUMENTS OR BETWEEN THESE BID DOCUMENTS AND THE RELATED HVAC, FIRE PROTECTION, ELECTRICAL, STRUCTURAL, ARCHITECTURAL, INTERIOR DECOR AND SITE ENGINEERING DRAWINGS, OR BETWEEN THESE BID DOCUMENTS AND FIELD CONDITIONS MUST BE BROUGHT TO THE ATTENTION OF THE OWNER, ARCHITECT AND ENGINEER PRIOR TO BID SUBMISSION.
- ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH ALL APPLICABLE REGULATIONS INCLUDING BUT NOT LIMITED TO NATIONAL, CITY, STATE, LOCAL CODES AND ORDINANCES WHICH MAY BE IN EFFECT. ALL PLUMBING MATERIALS, INSTALLATION PROCEDURES AND SYSTEM LAYOUTS SHALL BE APPROVED BY ALL APPLICABLE CODE ENFORCEMENT AUTHORITIES HAVING JURISDICTION, AND IT SHALL BE THE PLUMBING CONTRACTOR'S RESPONSIBILITY TO OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND APPROVALS FOR THIS INSTALLATION.
- THE PLUMBING CONTRACTOR MUST VISIT THE SITE AND NOTE ALL EXISTING CONDITIONS AS WELL AS ALL CONDITIONS TO BE MET, PRIOR TO BID SUBMISSION. LACK OF A THOROUGH UNDERSTANDING OF THE PROJECT SCOPE AND CONDITIONS SHALL NOT CONSTITUTE AN EXCUSE FOR ERRORS OR OMISSIONS, NOR FOR A REQUEST FOR EXTRA COMPENSATION.
- IT IS CRITICAL THAT THE PLUMBING CONTRACTOR FIELD VERIFIES ALL EXISTING INVERTS PRIOR TO BID SUBMISSION. IF ANY CONFLICTS EXIST BETWEEN THE NEW PLUMBING SYSTEMS AND THE EXISTING SITE LEVEL SYSTEMS, THEY SHOULD BE BROUGHT TO THE ATTENTION OF AN OWNER'S REPRESENTATIVE AND THE ENGINEER PRIOR TO BID SUBMISSION. EXTRA COMPENSATION WILL NOT BE ALLOWED FOR ANY EXTRA WORK WHICH RESULTS FROM AN INABILITY TO MEET THE INVERTS OF THE EXISTING SITE LEVEL PIPING SYSTEMS.
- THE PLUMBING CONTRACTOR SHALL PROVIDE A COMPLETE SET OF RECORD "AS-BUILT" DRAWINGS INDICATING THE PRECISE LOCATION OF ALL SYSTEMS, EQUIPMENT CONCEALED OR EMBEDDED PIPING, PIPING CONNECTIONS AND ACCESS DOORS. THESE DRAWINGS SHALL ALSO INCLUDE ALL CHANGES AND DEVIATIONS FROM BID DOCUMENTS.
- RUN ALL DOMESTIC, WASTE & VENT PIPING AS HIGH AS POSSIBLE THROUGHOUT ENTIRE BUILDING. INSTALL LONG RUNS OF PIPING WITHIN STEEL (JOIST) SPACE AND OTHER PIPING TIGHT TO BOTTOM OF STEEL. COORDINATE AND VERIFY WITH OTHER CONTRACTORS AS NOT TO INTERFERE WITH DUCTWORK, FIRE PROTECTION PIPING, LIGHTING SYSTEMS, ETC.
- ALL EXPOSED HORIZONTAL AND VERTICAL PIPING SHALL BE INSTALLED IN A NEAT ARRANGEMENT IN LOCATIONS WHICH ARE THE MOST INCONSPICUOUS. VERTICAL DROPS SHALL BE KEPT TO AN ABSOLUTE MINIMUM AND THEIR FINAL LOCATIONS SHALL BE COORDINATED AND RUN WITHIN CHASES, WALLS, SOFFITS WITH OTHER MECHANICAL/ELECTRICAL FEEDS. ALL SUCH LOCATIONS ARE TO BE REVIEWED WITH A OWNER REPRESENTATIVE AND ARCHITECT PRIOR TO INSTALLATION.
- ALL PLUMBING FIXTURES/APPLIANCES SHALL HAVE THEIR OWN INDEPENDENT SHUT-OFF VALVES, INSTALLED IN AN EASILY ACCESSIBLE AND CONVENIENT LOCATION.
- ALL DOMESTIC WATER BRANCH LINES SHALL HAVE THEIR OWN RESPECTIVE SHUT-OFF VALVES.
- DOMESTIC HOT WATER HEATER TEMPERATURE/PRESSURE RELIEF VALVES SHALL BE PIPED FULL SIZE TO THE NEAREST APPROVED STANDPIPE OR FLOOR DRAIN. THIS REQUIREMENT SHALL BE APPLICABLE TO ALL DOMESTIC WATER HEATERS EXCEPT INSTANTANEOUS WATER HEATERS.
- ALL PLUMBING VENT LINES NOTED AS "V. UP" OR "VENT UP" SHALL BE CONNECTED TO THE NEAREST APPROVED "V.T.R." OR "VENT THRU ROOF."
- PRIOR TO INSTALLING SYSTEMS, THE PLUMBING CONTRACTOR SHALL MEET WITH THE ARCHITECTS REPRESENTATIVE TO FIELD VERIFY THE EXACT LOCATION OF ALL PROPOSED EQUIPMENT WHICH MAY NOT BE CLEARLY INDICATED ON THE DRAWINGS.
- SANITARY SEWER PIPING SHOWN IS BASED ON .25" PER FOOT FALL FOR ALL PIPING SMALLER THAN 4", AND .125" PER FOOT FALL FOR ALL PIPING 4" AND LARGER.

PLUMBING SYMBOLS

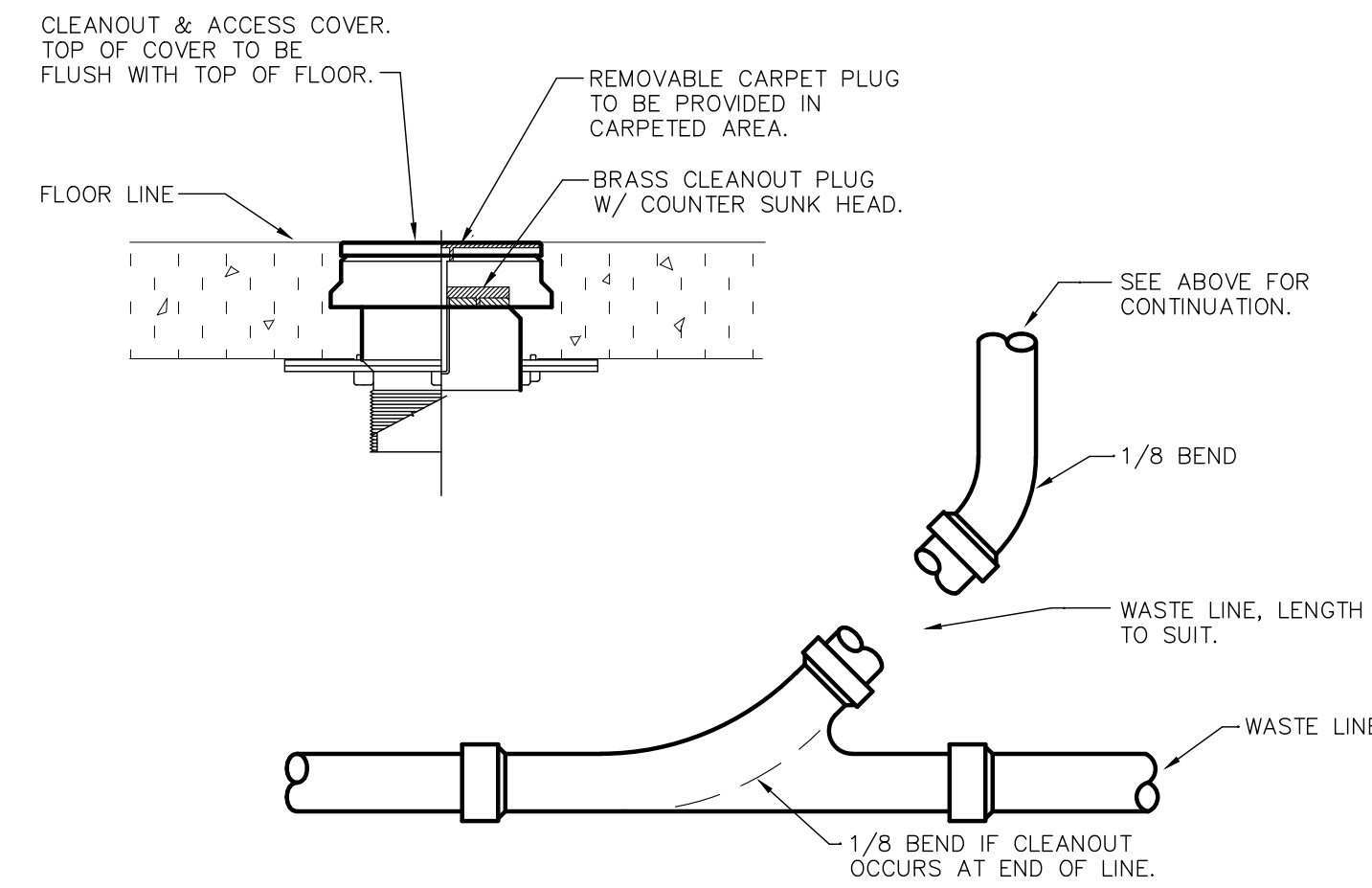


PLUMBING ABBREVIATIONS

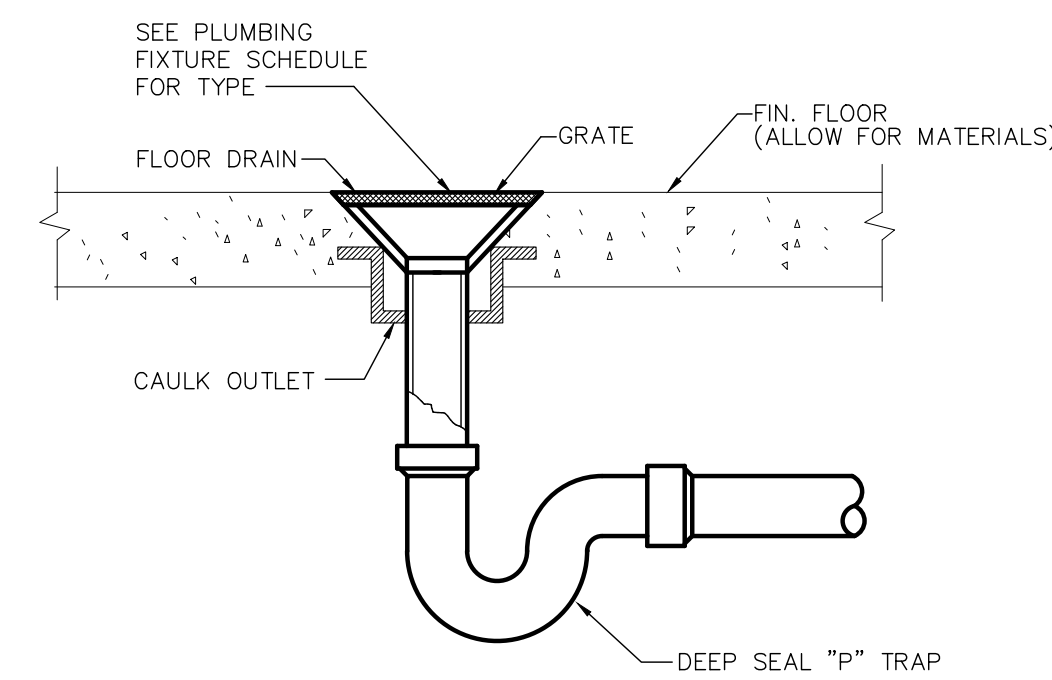
| | |
|----------|--------------------------|
| A.F.W.H. | ANTI-FREEZE WALL HYDRANT |
| A.D. | ACCESS DOOR |
| A.F.F. | ABOVE FINISHED FLOOR |
| B.F.P. | BACK FLOW PREVENTOR |
| CA | COMPRESSED AIR |
| CO. | CLEAN OUT |
| C.O.D.P. | CLEAN OUT DECK PLATE |
| D.I. | DRAINAGE INLET |
| EXIST. | EXISTING |
| E.W.C. | ELECTRIC WATER COOLER |
| F.A.I. | FRESH AIR INLET |
| FD. | FLOOR DRAIN |
| G.E. | GRADE ELEVATION |
| H.B. | HOSE BIBB |
| I.E. | INVERT ELEVATION |
| LAV. | LAVATORY |
| LDR. | LEADER |
| N.C. | NORMALLY CLOSED |
| N.I.C. | NOT IN CONTRACT |
| O.F. | OVERFLOW LEADER |
| O.R.D. | OVER-FLOW ROOF DRAIN |
| O.W. | OIL WASTE |
| R.D. | ROOF DRAIN |
| S. | SANITARY |
| SK. | SINK |
| S.S. | SERVICE SINK |
| ST | STORM DRAINAGE |
| T.E. | TOP ELEVATION |
| UR. | URINAL |
| VAC | VACUUM |
| V.B. | VACUUM BREAKER |
| V.T.R. | VENT THRU ROOF |
| W. | WASTE |
| W.C. | WATER CLOSET |
| W.C.O. | WALL CLEAN OUT |



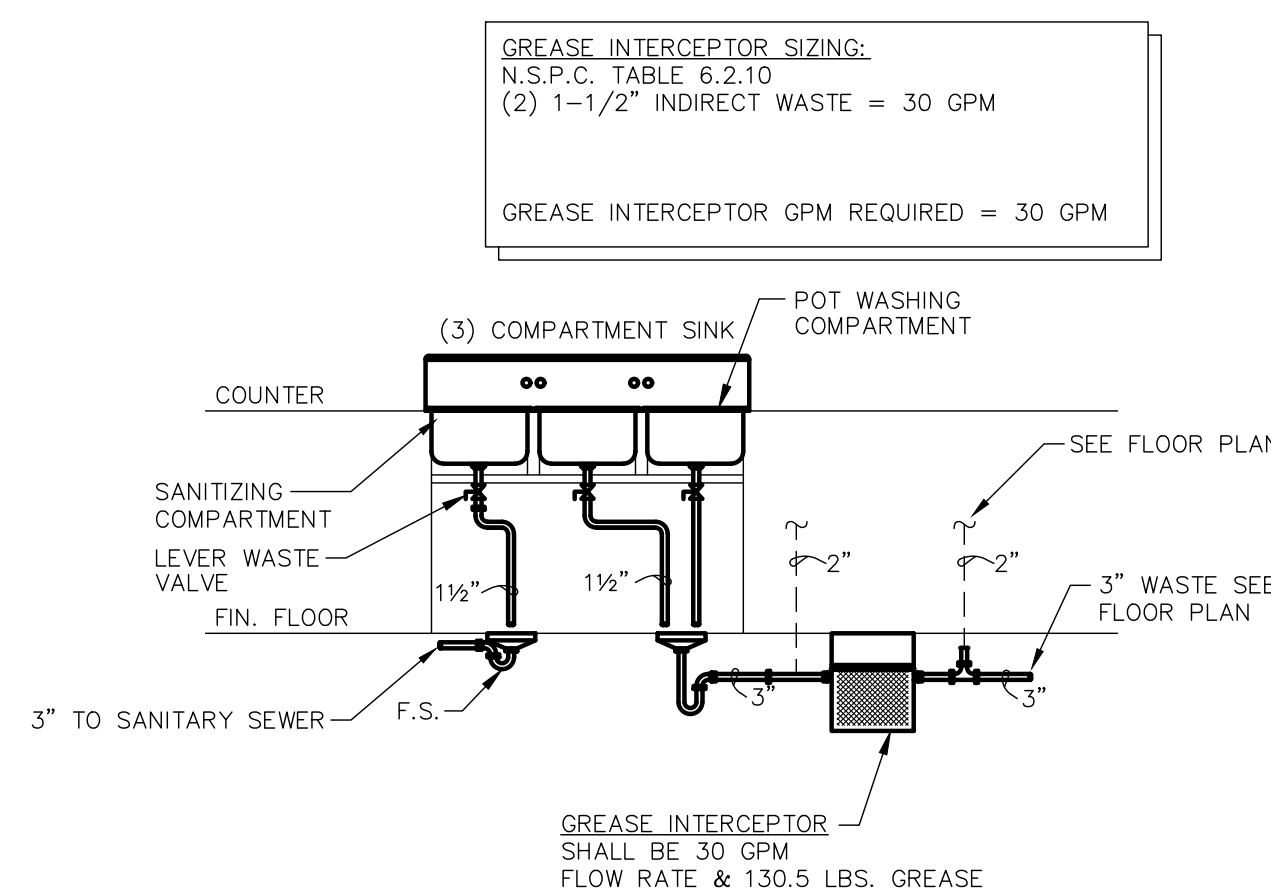
01 TYPICAL HANGER DETAIL
P0.1 N.T.S.



02 TYPICAL FLOOR CLEANOUT DETAIL
P0.1 N.T.S.



03 TYPICAL FLOOR DRAIN DETAIL
P0.1 N.T.S.



04 GREASE INTERCEPTOR DETAIL
P0.1 N.T.S.

| PLUMBING FIXTURE SCHEDULE | | | | | | | | | | | | | |
|---------------------------|--------------------------|-----------|--------------------|----------|-----------------|----------|-------------|------------|-------|------|----|----|--|
| NO. | FIXTURE | MFG. | TYPE AND MODEL NO. | TRIM NO. | SUPPLY PIPE NO. | TRAP NO. | SUPPORT NO. | PIPE SIZES | | | | | REMARKS |
| | | | | | | | | TRAP | WASTE | VENT | CW | HW | |
| F.S. | FLOOR SINK | MIFAB | FS1520-FL-150 | - | - | P-TRAP | - | - | - | - | - | - | WITH 1/2 GRATE AND DOME STRAINER. |
| FD | FLOOR DRAIN | MIFAB | F1000-7-5 | - | - | P-TRAP | - | - | - | - | - | - | PROVIDE WITH SEDIMENT BUCKET |
| A.F.W.H. | ANTI FREEZE WALL HYDRANT | MIFAB | MYH-20 | - | - | - | - | - | - | - | - | - | PROVIDE WITH VACUUM BREAKER AND OPERATION KEY. |
| T.P. | TRAP PRIMER | PPP, INC. | - | - | - | - | - | - | - | - | - | - | PROVIDE TRAP SEALS TO ALL FLOOR DRAINS. |

NOTES:

- PROVIDE TRAP SEALS ON ALL FLOOR DRAINS.
- PROVIDE MCGUIRE PRO-WRAP INSULATING KIT ON TRAPS AND HOT AND COLD WATER SUPPLIES TO ALL HANDICAPPED LAVATORIES. SEE ARCHITECTURAL DRAWINGS FOR LOCATIONS OF HANDICAPPED FIXTURES.
- PRIOR TO SUBMITTING SHOP DRAWINGS, THE CONTRACTOR SHALL COORDINATE FIXTURE TYPES AND COLORS WITH THE ARCHITECT.
- REFER TO THE ARCHITECTS DRAWINGS FOR LOCATION AND QUANTITIES OF HANDICAPPED FIXTURES. ALL HANDICAPPED FIXTURES SHALL BE INSTALLED AS PER ICC/ANSI A117.1-2009 REQUIREMENTS.

| PLUMBING EQUIPMENT SCHEDULE | | | | | | | | | | | |
|-----------------------------|--------------------|--------|----------|-------------|----------------------------------|-----------|------------|-------|-------|-----|---|
| GENERAL | | | | DESIGN DATA | | | ELECTRICAL | | | | REMARKS |
| ITEM | SERVICE | MFR. | NO. | CAPACITY | PUMP HEAD | H.P./K.W. | R.P.M. | VOLTS | PHASE | HZ. | |
| WH | WATER HEATER | NAVIEN | NPE-240A | TANKLESS | 5.1 G.P.M. @ 67 DEG. RISE | 350 W | --- | 120 | 1 | 60 | 199,900 BTU, CONDENSATE NEUTRALIZATION KIT. |
| G.I. | GREASE INTERCEPTOR | SCHIER | GB-2 | SEE DWG'S | 15 GPM/130.5 LBS GREASE CAPACITY | --- | --- | --- | --- | --- | PROVIDE EXTENSION RISER. INSTALL FLUSH WITH FINISHED FLOOR. |

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NJ 21A101699200
PA RA403776
MARGARET M. HICKEY, RA
NJ 21A1018244500

PROJECT No.: 1836C

DATE: 30 JUNE 2021

REVISIONS:

DRAWN BY: LAR

RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
TOWNSHIP OF PISCATAWAY
MIDDLESEX COUNTY, NEW JERSEY



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CERTIFICATE OF AUTHORIZATION NO.
24GA28124300

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James Sarco Jr., P.E.
Professional Engineer
State of New Jersey
DATE:
NEW JERSEY PROFESSIONAL ENGINEER
LICENSE NUMBER: 451590

P0.1

KEY NOTES

- CONNECT TO EXISTING 2" DOMESTIC WATER SERVICE. CONTRACTOR TO VERIFY EXISTING IN FIELD.
- 4" SANITARY SEWER REFER TO SITE PLAN FOR ADDITIONAL INFORMATION.
- GAS METER. GAS PRESSURE SHALL BE SET TO 7" W.C.
- 1/2" H.& C.W. DROP AND CONNECT TO SINK.
- 1/2" C.W. DROP AND CONNECT TO COFFEE MAKER AND ICE MAKER. PROVIDE SHUT-OFF VALVE AND B.F.P.
- 1 1/4" G., 3/4" H.&C.W. DROP AND CONNECT TO WATER HEATER.
- 3/4" C.W. DROP TO A.F.W.H.
- 2" V. RISE.
- GAS PIPING DROP AND CONNECT TO RANGE. PROVIDE A SOLENOID VALVE.
- CONNECT TO MECHANICAL UNIT.
- GAS PIPING RISE.

GENERAL NOTES

- PROVIDE TRAP SEALS FOR ALL FLOOR DRAINS.
- PROVIDE THERMOSTATIC MIXING VALVE (ASSE 1070) AT HAND SINKS.

CONNOLLY & HICKEY

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PA RA403776
MARGARET M. HICKEY, RA
NJ 21A1018244500

PROJECT No.: 1836C

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DRAWN BY: LAR

**RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
TOWNSHIP OF PISCATAWAY
MIDDLESEX COUNTY, NEW JERSEY**

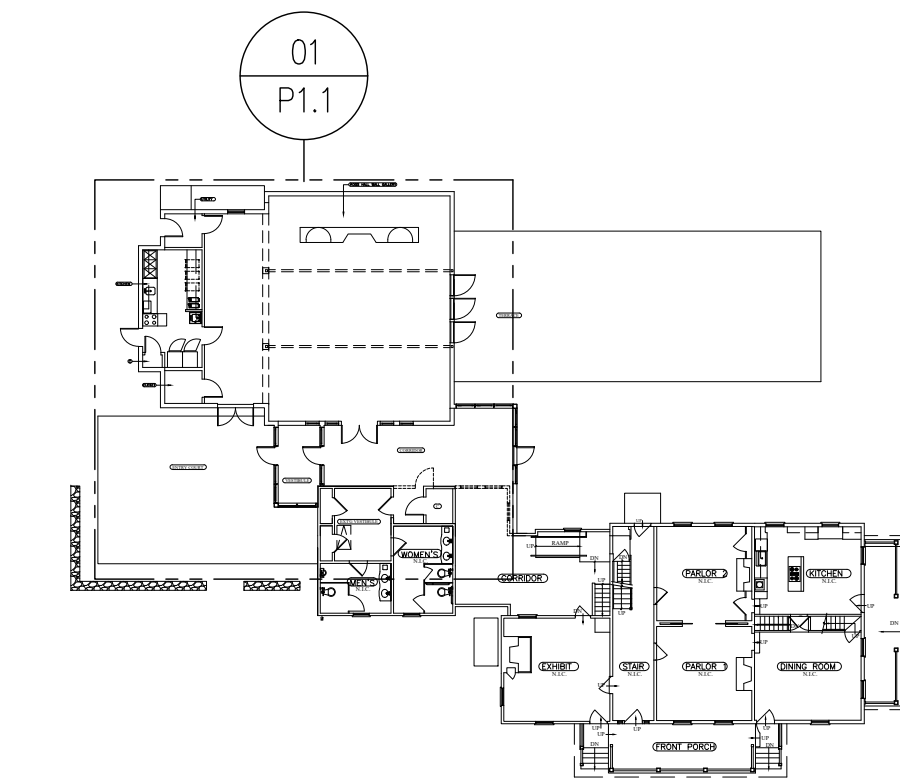


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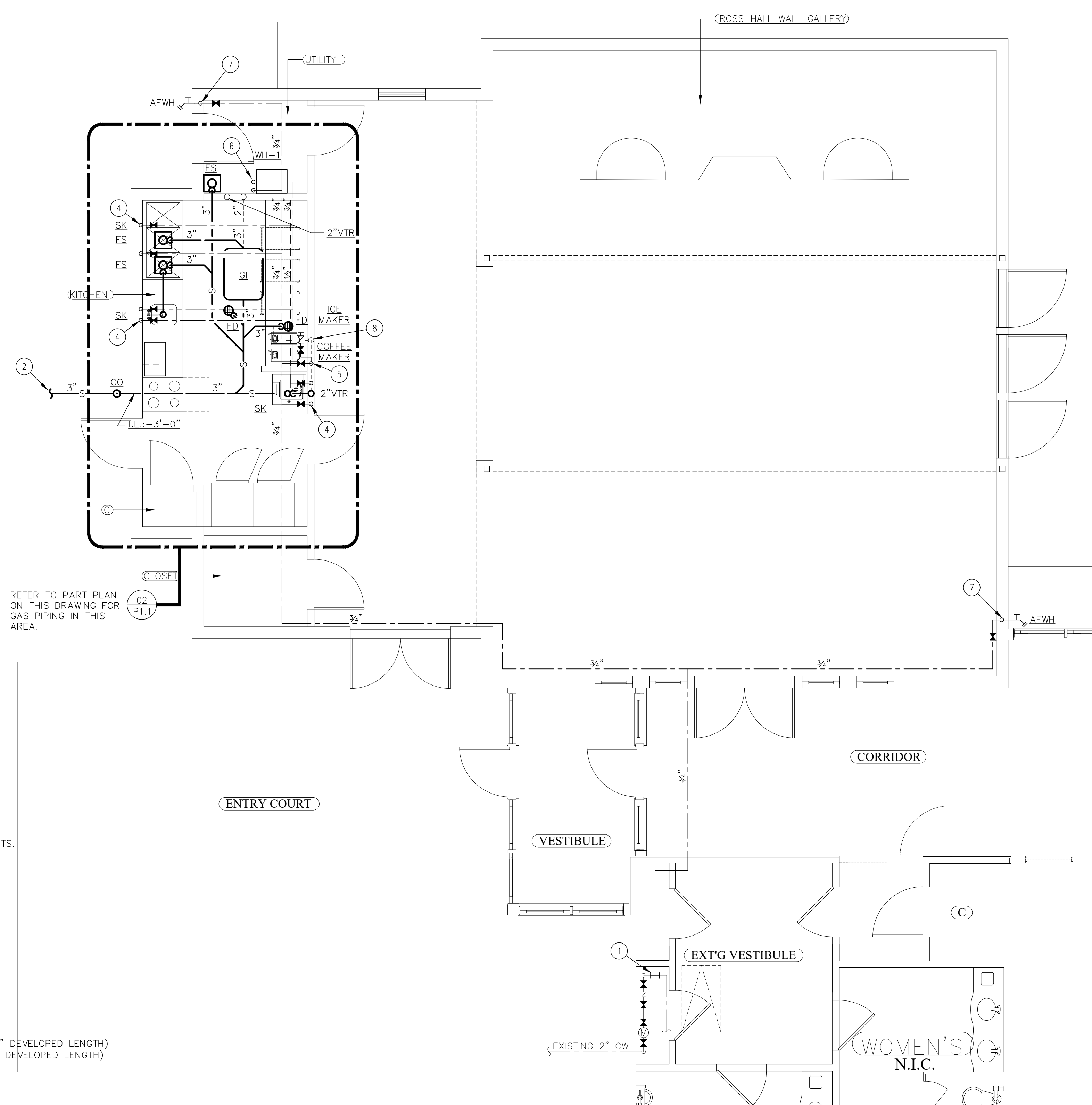
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James Sarro Jr., P.E.
Professional Engineer
State of New Jersey

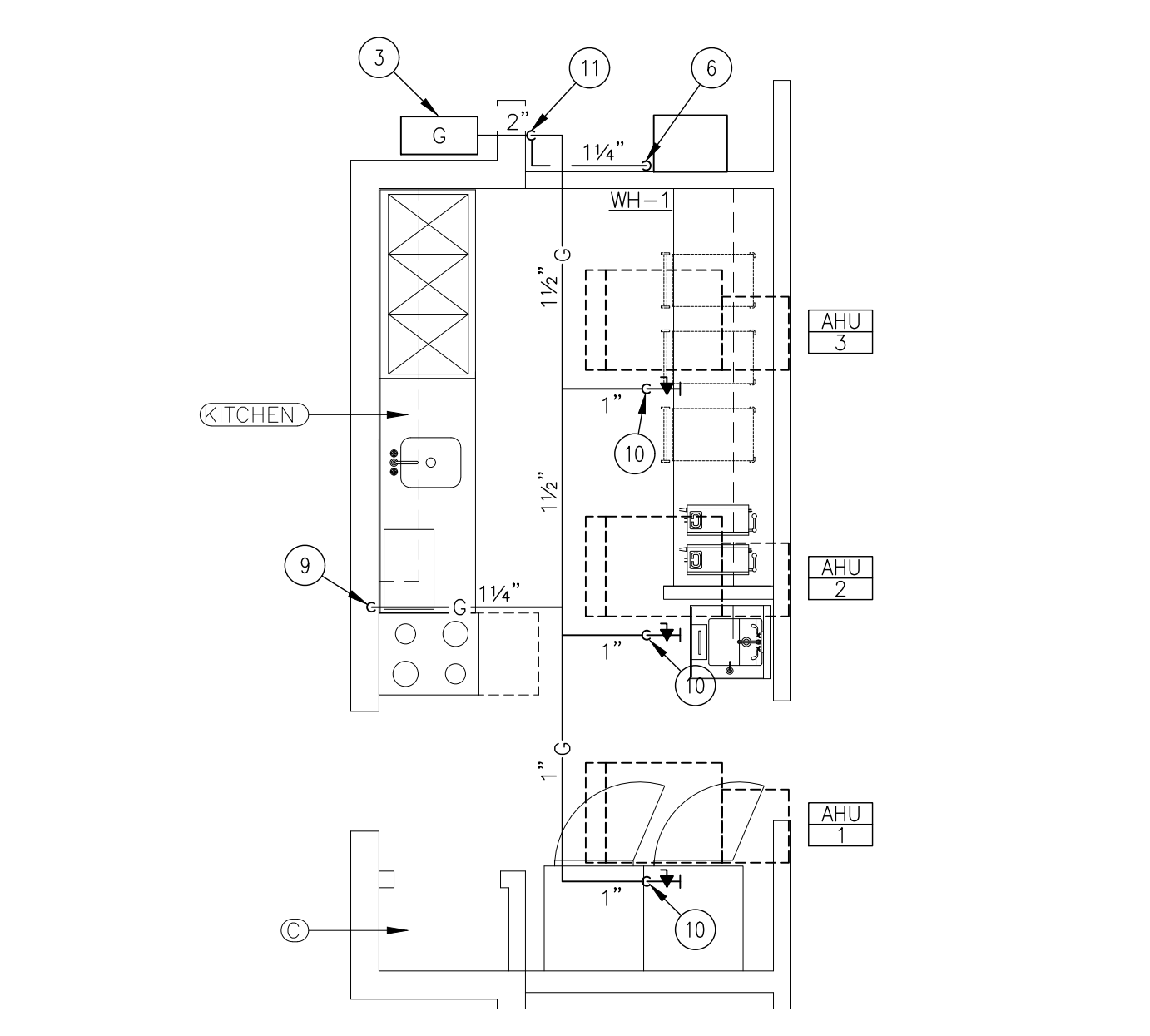
DATE:
NEW JERSEY PROFESSIONAL ENGINEER
LICENSE NUMBER: 451590



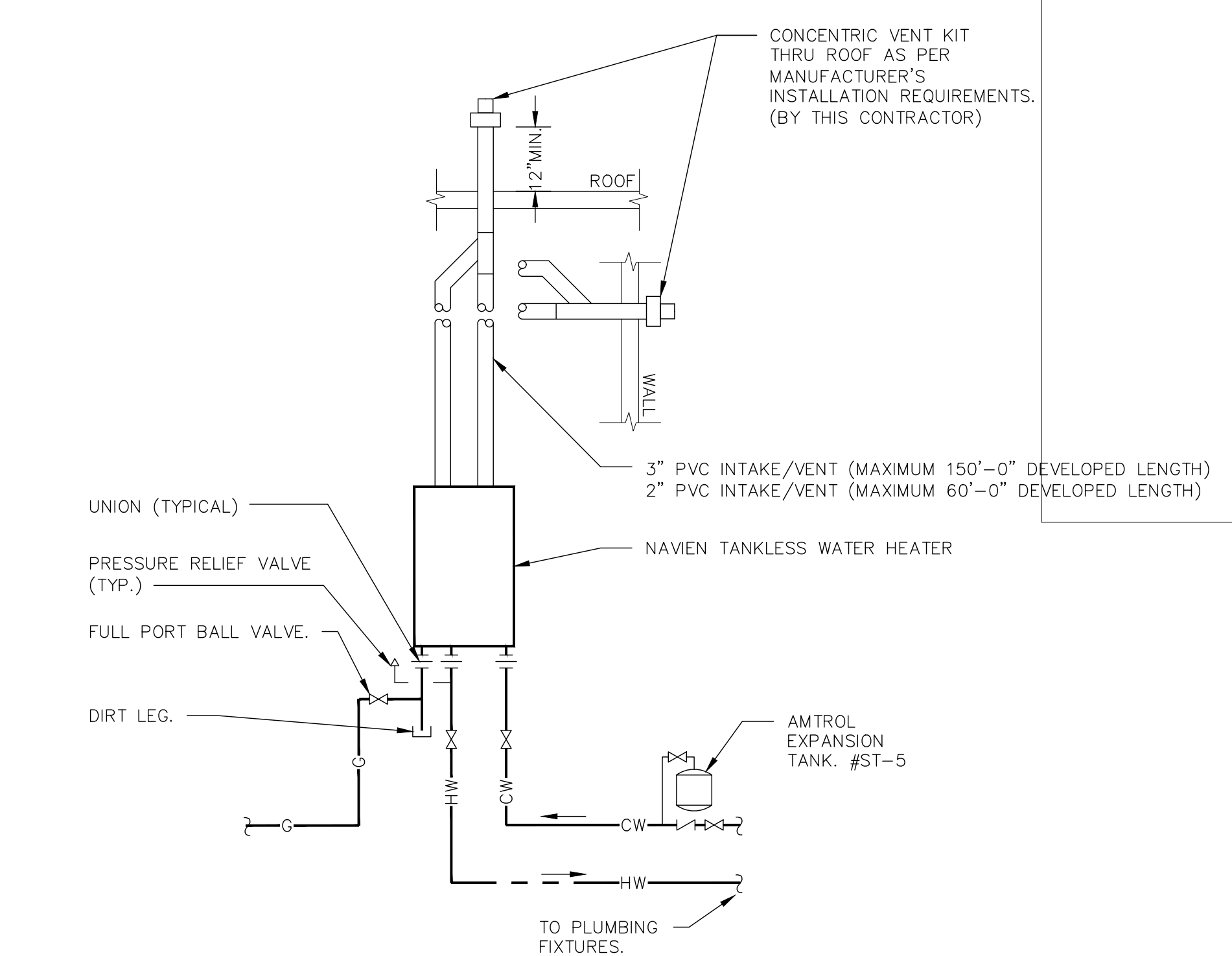
04 FIRST FLOOR KEY PLAN
1/32"=1'-0"



01 PLUMBING FIRST FLOOR PART PLAN
1/4"=1'-0"



02 PLUMBING FIRST FLOOR PART PLAN
1/4"=1'-0"



03 WATER HEATER INSTALLATION
N.T.S.

REFER TO PART PLAN ON THIS DRAWING FOR GAS PIPING IN THIS AREA.

CONCENTRIC VENT KIT THRU ROOF AS PER MANUFACTURER'S INSTALLATION REQUIREMENTS. (BY THIS CONTRACTOR)

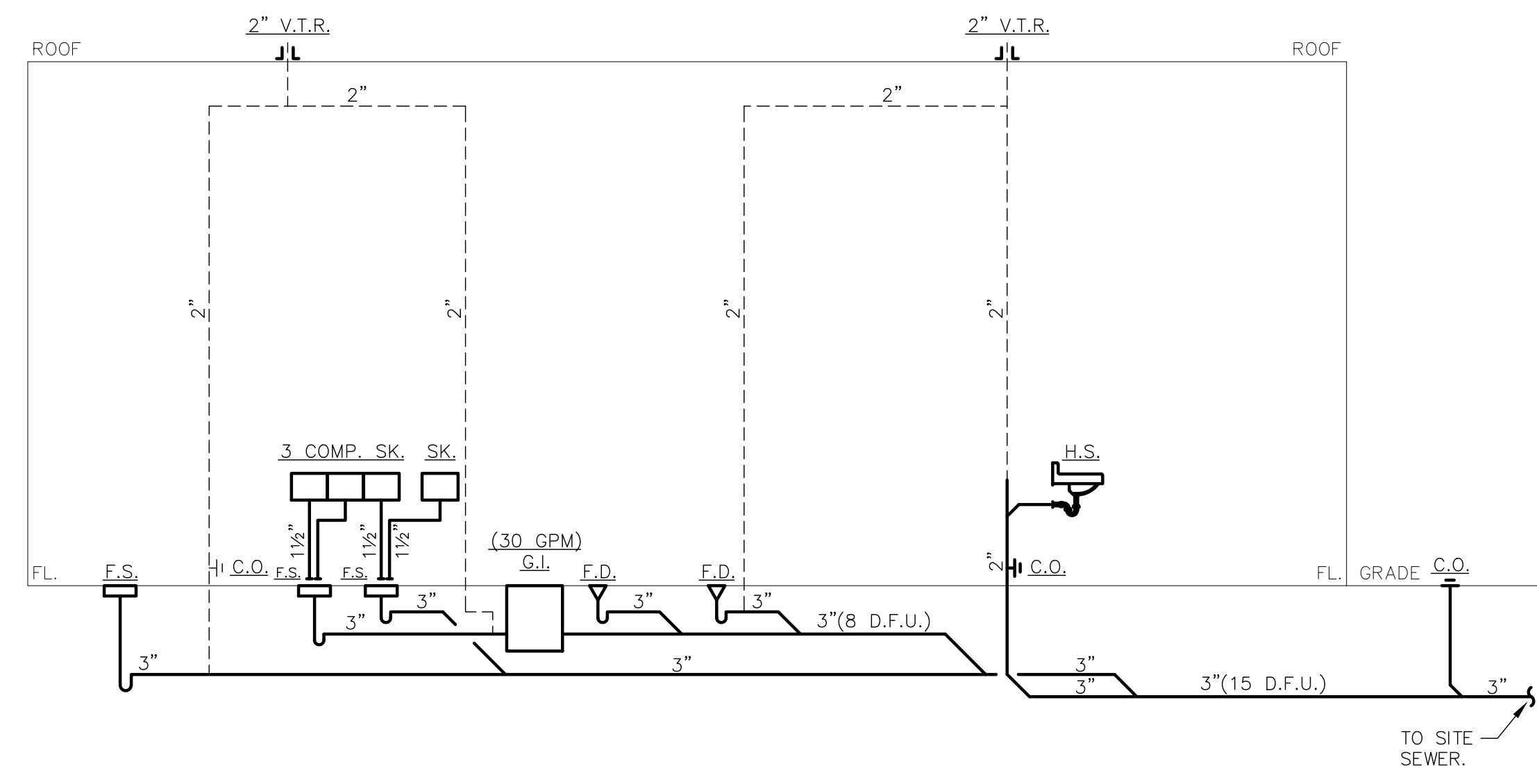
3" PVC INTAKE/VENT (MAXIMUM 150'-0" DEVELOPED LENGTH)
2" PVC INTAKE/VENT (MAXIMUM 60'-0" DEVELOPED LENGTH)

NAVEN TANKLESS WATER HEATER

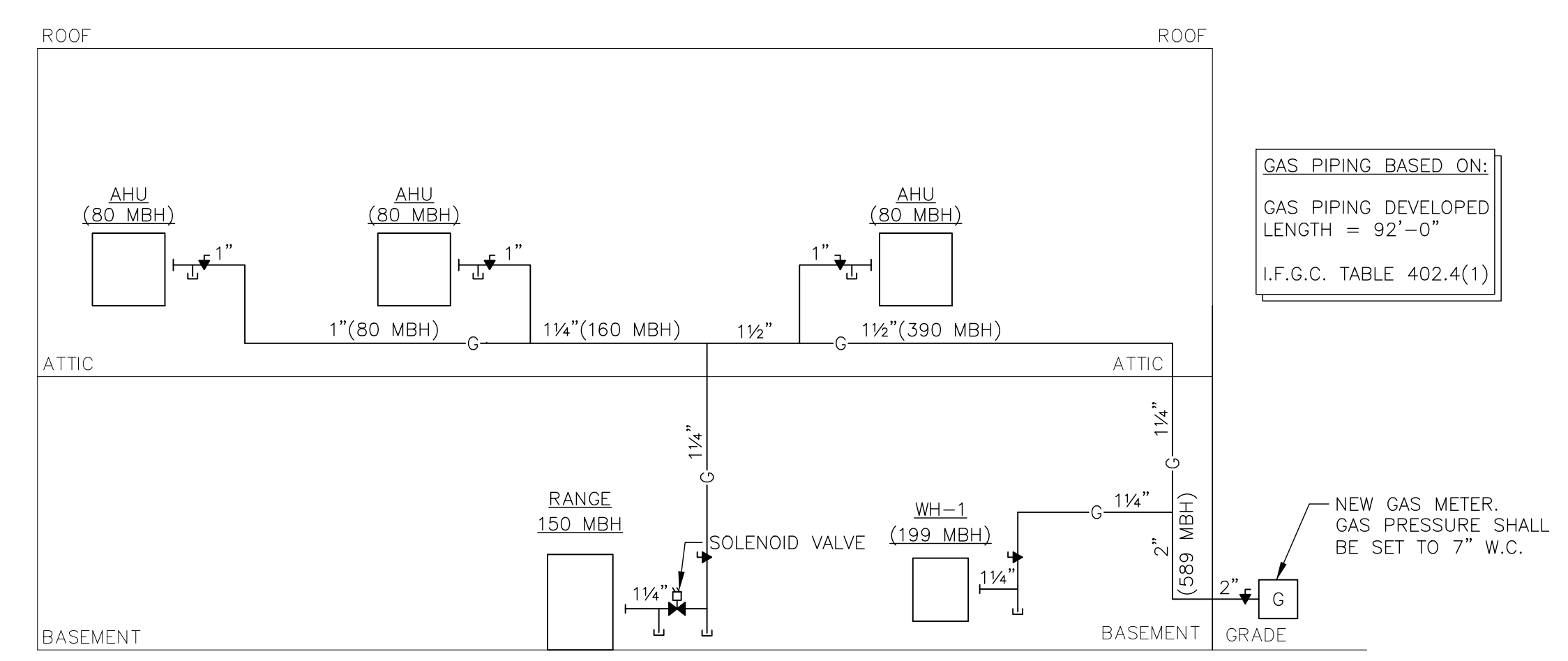
AMTROL EXPANSION TANK, #ST-5

TO PLUMBING FIXTURES.

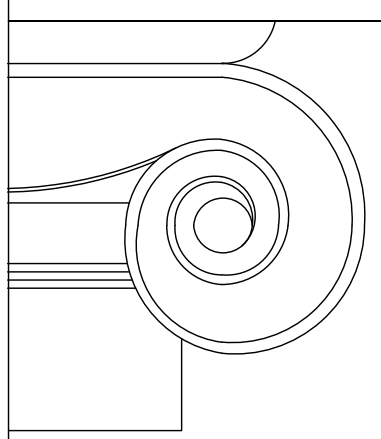
FL.



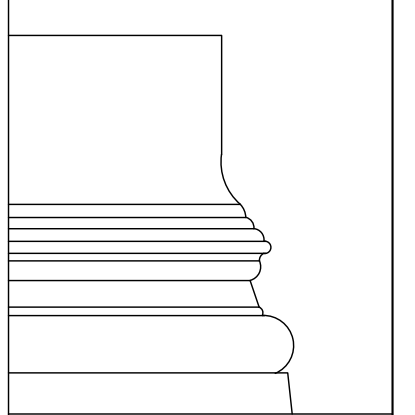
01 SANITARY RISER DIAGRAMS
P2.1 N.T.S.



02 GAS RISER DIAGRAMS
P2.1 N.T.S.



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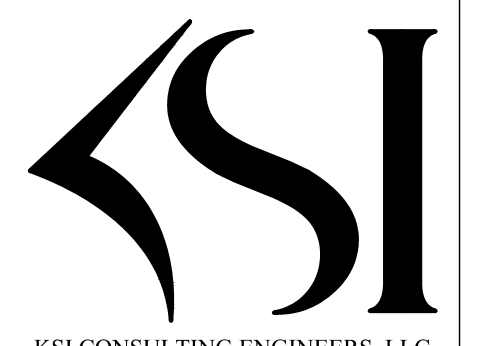
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NJ 21A101699200
PA RA403776
MARGARET M. HICKEY, RA
NJ 21A1018244500

PROJECT No.: 1836C
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REVISIONS:

DRAWN BY: LAR

**RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
TOWNSHIP OF PISCATAWAY
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James Sarno Jr., P.E.
Professional Engineer
State of New Jersey

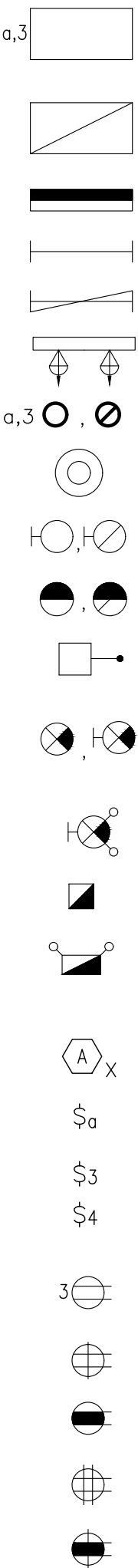
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NEW JERSEY PROFESSIONAL ENGINEER
LICENSE NUMBER: 451590

P2.1

ELECTRICAL GENERAL NOTES

- ALL ELECTRICAL WORK SHALL CONFORM TO THE LATEST ADOPTED EDITIONS OF THE NATIONAL ELECTRICAL CODE, THE NFPA, N.J.A.C. AND THE INTERNATIONAL BUILDING CODE.
- THE CONTRACTOR MUST HAVE THE H.V.A.C., FIRE PROTECTION AND PLUMBING DRAWINGS FOR LOCATIONS OF EQUIPMENT AND CONTROL WIRING REQUIREMENTS. ONLY POWER FEEDER TO MECHANICAL EQUIPMENT ARE SCHEDULED ON THE ELECTRICAL DRAWINGS. FURNISH AND INSTALL ALL CODE REQUIRED DISCONNECT SWITCHES FOR MECHANICAL EQUIPMENT UNLESS SPECIFIED ON MECHANICAL DRAWINGS TO BE SUPPLIED BY MANUFACTURER. PROVIDE FUSED SWITCHES WHEREVER MANUFACTURER REQUIRES THEM.
- ALL TELEPHONE/DATA WIRING IS BY THE OWNER.
- CONDUCTOR SIZES(PHASE AND BOND) SHALL BE INCREASED DUE TO DERATING AND VOLTAGE DROP REQUIREMENTS AS NECESSARY. USE A MINIMUM #10 AWG FOR 20 AMPERE CIRCUITS AS FOLLOWS: 120V. - OVER 120'. 208V. - OVER 210'. 277V. - OVER 270'. 480V. - OVER 484'(BASED ON LOAD AT MIDPOINT OF BRANCH CIRCUIT RUN @ 60% OF RATED LOAD). USE #8 FOR 20A. CIRCUITS @ 277V. FROM 211' TO 334'. AND 20A CKTS @ 120V. FROM 191' TO 301'.(FOR #8 PROVIDE AND INSTALL SPLICE/TAP J-BOX BEFORE CONNECTION TO LOAD AND TRANSFER TO #12AWG FOR CONNECTION TO DEVICE TERMINALS).
- PANELBOARD LOCKS SHALL BE KEYED IN ACCORDANCE TO OWNER REQUIREMENTS.
- SEPARATE NEUTRALS SHALL BE RUN FOR ALL CIRCUITS.
- ALL RACEWAYS FEEDING ISOLATED GROUND DEVICES SHALL INCLUDE AN ISOLATED GROUND WIRE SIZED IN ACCORDANCE TO THE NEC.
- AS-BUILTS SHALL BE PROVIDED WITHIN 30 DAYS OF SYSTEM ACCEPTANCE, INCLUDING BUT NOT LIMITED TO SINGLE-LINE OF ELECTRICAL DISTRIBUTION SYSTEM AND FLOOR PLAN WITH LOCATIONS OF DISTRIBUTION EQUIPMENT AND AREAS SERVED BY THAT EQUIPMENT.(ASHRAE/IESNA STANDARD 90.1-1999.)
- O & M MANUALS MUST BE PROVIDED FOR THE ELECTRICAL DISTRIBUTION SYSTEM, INCLUDING BUT NOT LIMITED TO NAMEPLATE RATINGS, SCHEDULED MAINTENANCE, SPECIFIC EQUIPMENT SUPPLIED, NAMES AND ADDRESSES OF QUALIFIED SERVICE AGENCIES, COMPLETE NARRATIVE AND SCHEMATIC OF SYSTEM IN NORMAL OPERATION.(ASHRAE/IESNA STANDARD 90.1-1999.)

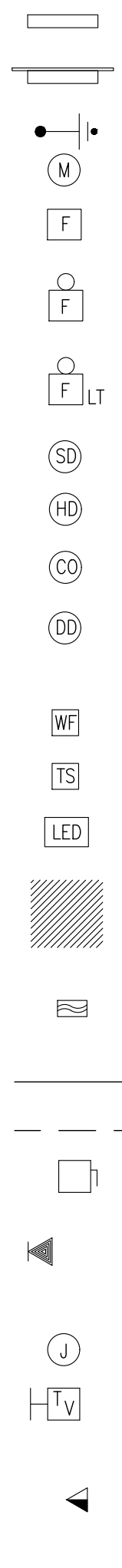
SYMBOL



ELECTRICAL SYMBOL LEGEND

(DEVICE AND EQUIPMENT MOUNTING HEIGHTS ARE AS LISTED ON DRAWING AND/OR DESCRIBED IN SPECIFICATIONS UNLESS ITEMIZED BY ARCHITECTURAL DOCUMENTS.) (NOT ALL SYMBOLS ARE REPRESENTED ON DRAWINGS)

SYMBOL



DESCRIPTION

PANEL BOARD (LIGHTING OR RECEPTACLE) SURFACE MOUNTED
 PANEL BOARD (LIGHTING OR RECEPTACLE) RECESSED
 GROUND ROD
 ELECTRIC METER
 FIRE ALARM MANUAL PULL STATION - 48"A.F.F. TO TOP OF DEVICE.
 COMBINATION FIRE ALARM HORN STROBE (ADA) AS PER SPECIFICATIONS - 80" A.F.F. TO BOTTOM OF DEVICE 15/75 CD MINIMUM. U.O.N.(TYPICAL).
 FIRE ALARM STROBE (ADA) - 80" AFF TO BOTTOM OF DEVICE 15/75 CD MINIMUM. U.O.N.(TYPICAL).
 FIRE ALARM SMOKE DETECTOR (PHOTOELECTRIC UNLESS OTHERWISE NOTED). (I= IONIZATION) (ADDRESSABLE) CEILING MOUNTED.
 FIRE ALARM HEAT DETECTOR - FIXED TEMP/RATE TO RISE. U.O.N.
 CARBON MONOXIDE DETECTOR
 FIRE ALARM DUCT SMOKE DETECTOR(ADDRESSABLE)
 SPRINKLER WATER FLOW SWITCH
 SPRINKLER TAMPER SWITCH
 REMOTE LED ANNUNCIATOR PANEL
 ITEMS TO BE DEMOLISHED AND REMOVED
 OCCUPANCY SENSOR
 EXPOSED CONDUIT OR CABLE
 CONCEALED CONDUIT OR CABLE
 DISCONNECT SWITCH
 WALL MOUNTED TELEPHONE OUTLET 1'-4", PS = PAYSTATION AT 48" AFF TO TOP OF DEVICE. 3/4" CDT TO ABOVE ACCESS CEILING SPACE WITH PULLSTRING AND END BUSHINGS.
 JUNCTION BOX, CEILING OR WALL MOUNTED AS NOTED, ELECTRICAL CONTRACTOR TO MAKE ALL REQUIRED CONNECTIONS TO DESIGNATED EQUIPMENT.
 TV MONITOR OUTLET & RECEPTACLE - 3/4"CDT TO ABOVE ACCESSIBLE CEILING SPACE WITH COMPLETE RACEWAY ACCESS BACK TO CATV HEAD END.
 COMBINATION TELE/COMM OUTLET W/ 1" CDT. RUN TO ABOVE ACCESSIBLE CEILING SPACE 1'-4" AFF TO 1/2 OF DEVICE. PROVIDE PULLSTRING AND END BUSHINGS

ELECTRICAL ABBREVIATION LEGEND

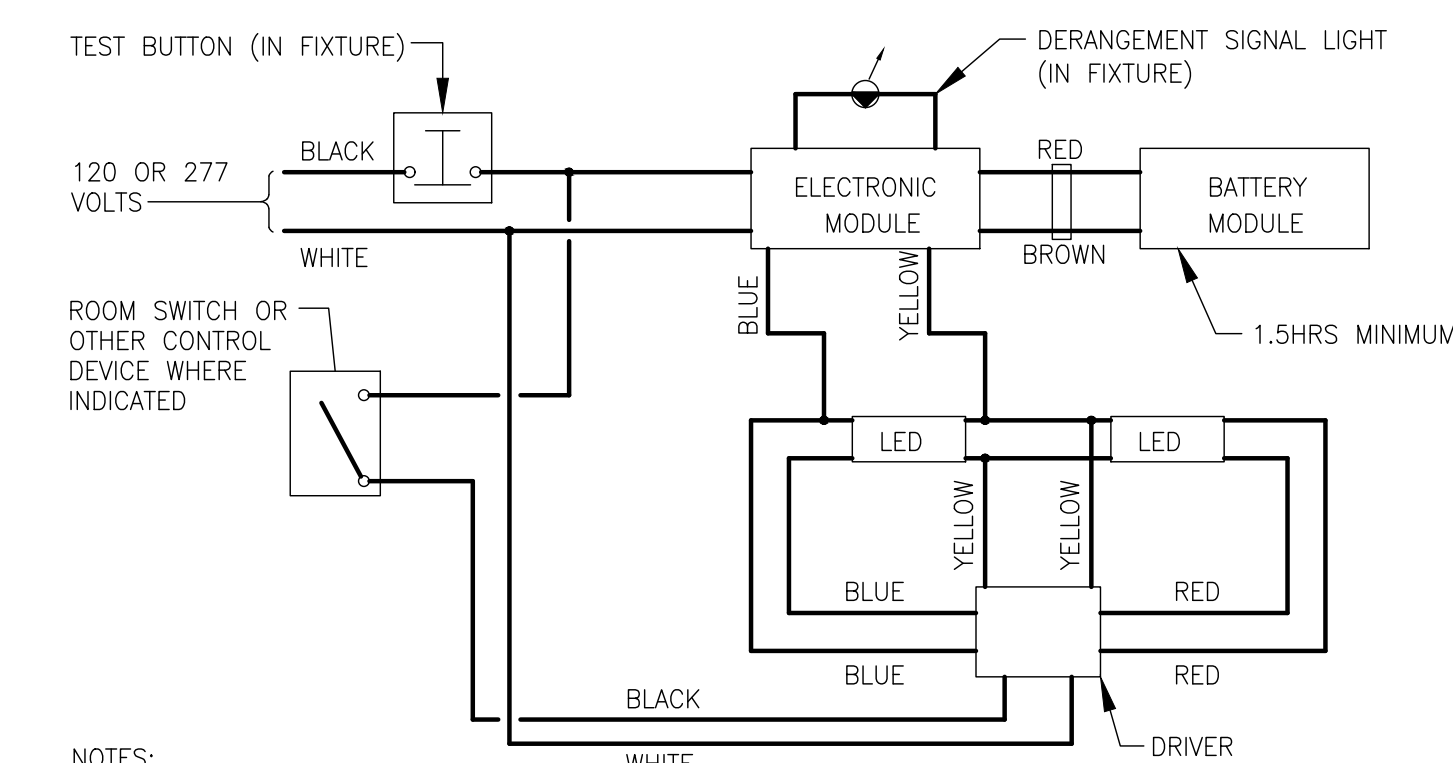
ABBREVIATION

A AMPERE
 AC ALTERNATING CURRENT
 AFF ABOVE FINISHED FLOOR
 AHJ AUTHORITY HAVING JURISDICTION
 AHU AIR HANDLING UNIT
 AWG AMERICAN WIRE GAGE
 C CONDUIT
 CB CIRCUIT BREAKER
 CH ABOVE COUNTER HEIGHT
 D/S DISCONNECT SWITCH
 E EXISTING
 EC ELECTRICAL CONTRACTOR
 EMT ELECTRICAL METALLIC TUBING
 ER EXISTING TO BE RELOCATED
 FACP FIRE ALARM CONTROL PANEL
 G GROUND
 GFI GROUND FAULT CIRCUIT INTERRUPTER
 JB JUNCTION BOX

DESCRIPTION

KCML THOUSAND CIRCULAR MILS
 KVA KILOVOLT - AMPERE
 KW KILOWATT
 LP LIGHTING PANEL
 MCB MAIN CIRCUIT BREAKER
 MDP MAIN DISTRIBUTION PANEL
 MLO MAIN LUGS ONLY
 N NEW
 NIC NOT IN CONTRACT
 Ø PHASE
 PNL PANEL
 PP POWER PANEL
 PVC POLY VINYL CHLORIDE CONDUIT
 R RELOCATED IN NEW POSITION
 RP RECEPTACLE PANEL
 SW SWITCH
 V VOLT
 WP WEATHER PROOF (NEMA RATED)(WHILE IN USE)

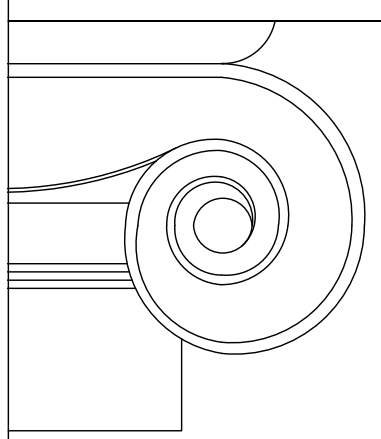
| TYPE | DESCRIPTION | MANUFACTURER | CATALOG # | MOUNTING | | BALLAST/ DRIVER | CONTROL |
|--------|--|--------------|--|----------|----------------------|-----------------|---|
| | | | | VOLT | | | |
| A | MOVE IT 1.1 TRACK WITH UPLIGHT 8' SECTION COORDIANTE LENGTH AND CONFIGURATION WITH ARCHITECT | XAL | MOVE1.1-PDT-BL-48V-010V-RS | 120V | PENDANT | ELECTRONIC | LOCAL |
| A1 | TRACK HEAD WITH FIXTURE TYPE A COORDIANTE LENGTH AND CONFIGURATION WITH ARCHITECT | XAL | MOVEINS-JUST55-BL-30K-C90-FL-DC10-1100LM | 120V | TRACK | ELECTRONIC | LOCAL |
| B | MOVE IT 1.1 TRACK 8' SECTION COORDIANTE LENGTH AND CONFIGURATION WITH ARCHITECT | XAL | MOVE1.1-SUR-BL-48V-DC10-ST-30FT | 120V | SURFACE | ELECTRONIC | LOCAL |
| B1 | TRACK HEAD WITH FIXTURE TYPE B COORDIANTE LENGTH AND CONFIGURATION WITH ARCHITECT | XAL | MOVE1.1-SUR-BL-48V-DC10-ST-30FT | 120V | SURFACE | ELECTRONIC | LOCAL |
| C | WALL WASH FIXTURE | HALO | HL36A-20-FL-930-ED010-ICAT/TL3LWW-66-MW | 120V | RECESSED | ELECTRONIC | LOCAL |
| DP | PENDANT MOUNTED LIGHT FIXTURE | OCL | LE1-P1FC-10-MW-XX-LED1-30K-UNV-48-DM3 | 120V | PENDANT | ELECTRONIC | LOCAL |
| DW | LED WALL SCONCE | KUZCO | WS10324-WH | 120V | WALL | ELECTRONIC | LOCAL |
| E | EDGE LIT LED EXIT LIGHT WITH INTEGRAL BATTERY COORDIANTE COLOR AND LETTER COLOR WITH ARCHITECT | EVENLITE | SOV-EM-XX-XX-RC-UC | 120V | AS SHOWN ON DRAWINGS | - | LOCAL LIGHTING CIRCUIT AHEAD OF SWITCHING |
| E1 | WALL MOUNTED EMERGENCY LIGHTING FIXTURE WITH 2 LEDS AND INTEGRAL BATTERY | DUAL LITE | EV4D-1-02WAL | 120V | AS SHOWN ON DRAWINGS | - | LOCAL LIGHTING CIRCUIT AHEAD OF SWITCHING |
| E2 | EXTERIOR EGRESS LIGHTING FIXTURE WITH INTEGRAL BATTERY AND 2 LAMPS | DUAL LITE | PGX | 120V | AS SHOWN ON DRAWINGS | - | LOCAL LIGHTING CIRCUIT AHEAD OF SWITCHING |
| F8 | LED UNDER CABINET LIGHTING | GM LIGHTING | UCTUN-8-WH | 120V | SURFACE | ELECTRONIC | LOCAL |
| P24 | LED UNDER CABINET LIGHTING | GM LIGHTING | UCTUN-24-WH | 120V | SURFACE | ELECTRONIC | LOCAL |
| P32 | LED UNDER CABINET LIGHTING | GM LIGHTING | UCTUN-32-WH | 120V | SURFACE | ELECTRONIC | LOCAL |
| G | RECESSED MOUNTED LIGHT FIXTURE | HALO | HL36A-10-WFL-930-ED010-ICAT/TL3R-2G-MW | 120V | SURFACE | ELECTRONIC | LOCAL |
| H | 4" RECESSED DOWNLIGHT | ALPHABET | NU4-RD-XTM19-13LM-30K-83-HE80-120-ELV-XX-WH-WH | 120V | RECESSED | ELECTRONIC | LOCAL |
| H ALT. | 4" RECESSED DOWNLIGHT | DMF LIGHTING | DRDH-N-JD/DRD2M-12-9-30-GA-T/DRD2T-R-JD-S-WH | 120V | RECESSED | ELECTRONIC | LOCAL |
| XA | EXTERIOR COLUMN LIGHT FIXTURE | LUMENPULSE | LIC-120-12-CSL-HO-30K-CR180-2-DIM | 120V | COLUMN | ELECTRONIC | LIGHTING CONTROL PANEL |
| XB2 | EXTERIOR BOLLARD LIGHT FIXTURE | LUMENPULSE | LIB-120-CSL-SO-30K-CR180-2-DIM | 120V | BOLLARD | ELECTRONIC | LIGHTING CONTROL PANEL |
| XB4 | EXTERIOR BOLLARD LIGHT FIXTURE | LUMENPULSE | LIB-120-CSL-SO-30K-CR180-4-DIM | 120V | BOLLARD | ELECTRONIC | LIGHTING CONTROL PANEL |
| XC | EXTERIOR LED WALL MOUNT LIGHT FIXTURE | LUMINAIRE | AEL-24IN-MIN10-2DRV-10W-30K-120-DP-SVH | 120V | WALL | ELECTRONIC | LIGHTING CONTROL PANEL |
| XD | EXTERIOR LED WALL MOUNT LIGHT FIXTURE COORDIANTE SPEC WITH ARCHITECT | - | - | 120V | WALL | ELECTRONIC | LIGHTING CONTROL PANEL |



- NOTES:
- WHERE INDICATED ON DRAWINGS THAT A FIXTURE IS CONTROLLED BY A LOCAL SWITCH, FIXTURE SHALL BE WIRED TO SHUT OFF WHEN SWITCH IS OFF. BATTERY MODULE IS ALWAYS HOT.
 - REFER TO MANUFACTURER'S WIRING DIAGRAM FOR ACTUAL CONDUCTOR COUNTS.
 - WHERE LIGHTING CONTROL SYSTEM IS APPLIED, THE BATTERY BALLAST MUST BE WIRED AHEAD OF SYSTEM RELAY.

01 ELECTRICAL LIGHTING FIXTURE SCHEDULE
 NONE

02 EMERGENCY LIGHTING WIRING DIAGRAM
 NONE



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PROJECT No.: 1836C

DATE: 30 JUNE 2021

REVISIONS:

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RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
 TOWNSHIP OF PISCATAWAY
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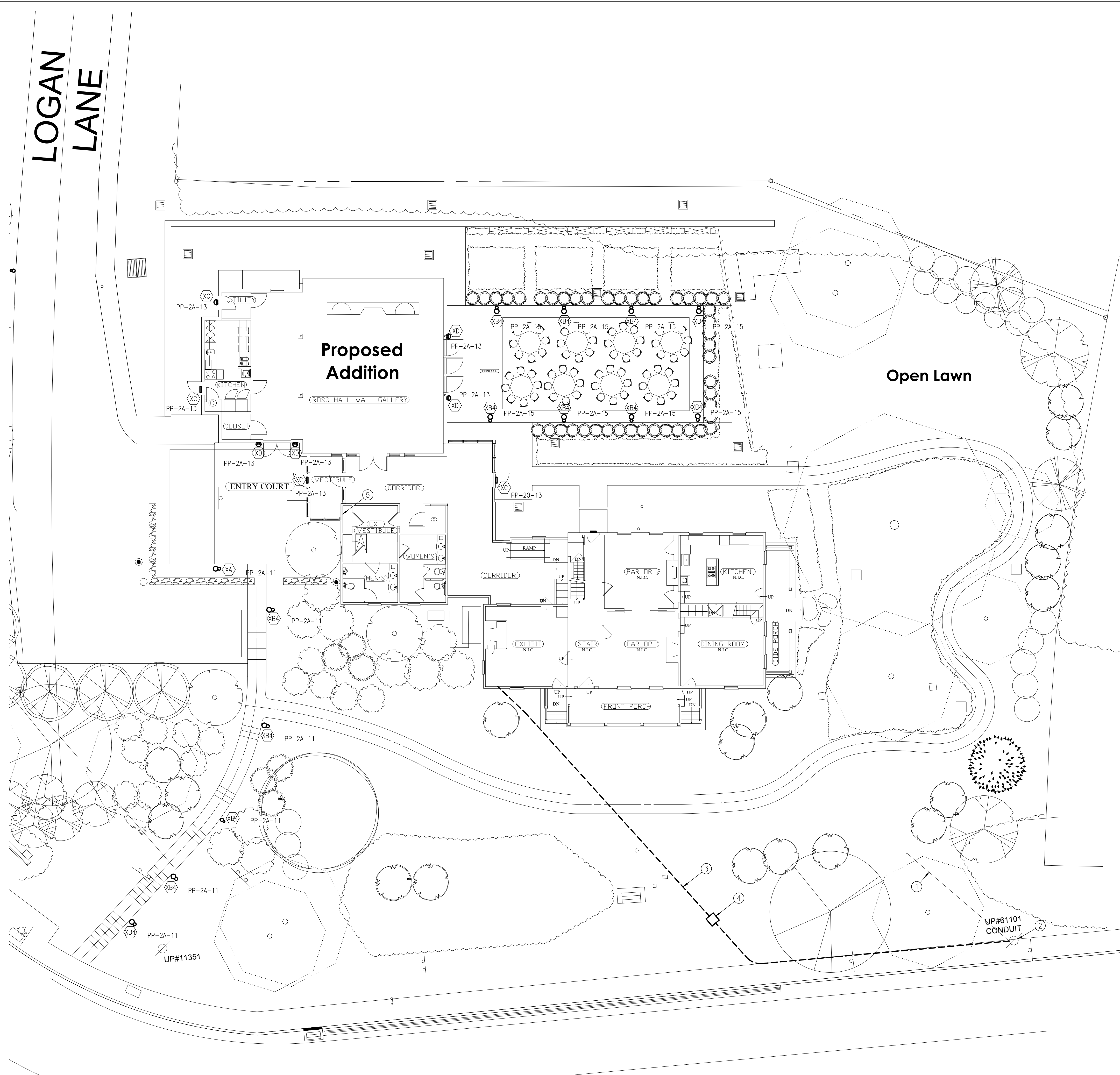
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E0.1

LOGAN LANE



01 ELECTRICAL SITE PLAN
SU1.1 3/32"=1'-0"

KEY NOTES

1. DEMOLISH EXISTING ELECTRICAL SERVICE CONDUCTORS AND CONDUIT FROM THE UTILITY POLE TO THE CT CABINET THAT IS SCHEDULED TO BE DEMOLISHED.
2. EXISTING UTILITY POLE THAT HAS EXISTING SERVICE AND IS PROPOSED TO PROVIDE UPGRADED SERVICE.
3. PROPOSED ROUTING OF THE NEW ELECTRICAL SERVICE. COORDINATE THE FINAL ROUTING WITH THE OWNER AND EXISTING CONDITIONS.
4. PROPOSED LOCATION OF PSE&G HAND HOLE. HAND HOLE SHALL BE PER PSE&G REQUIREMENTS. COORDINATE THE FINAL LOCATION OF THE HANDHOLE WITH THE OWNER AND PSE&G.
5. ALL EXTERIOR LIGHTING SHALL BE CONTROLLED THROUGH A LIGHTING CONTROL PANEL. PANEL SHALL BE MODEL NXP2 AS MANUFACTURED BY HUBBELL. PROVIDE WITH NXSW-TH3 TOUCH SCREEN CONTROLLER, NXDS-0 OUTDOOR PHOTOCELL. PROVIDE WITH DIMMING CONTROLS AND WIRING FOR FIXTURE TYPE XB2 AND XB4. COORDINATE THE SCHEDULE AND LOCATION OF THE TOUCH SCREEN WITH THE OWNER.

GENERAL NOTES

1. CONTRACTOR SHALL COORDINATE THE NEW ELECTRICAL SERVICE WITH PSE&G AND THE OWNER.
2. ALL NEW LIGHTING SHALL BE CIRCUITED TO PANEL PP-2B UNLESS OTHERWISE NOTED.
3. COORDINATE THE LOCATIONS OF ALL SITE LIGHTING WITH THE LIGHTING DESIGNER DRAWINGS.
4. COORDINATE ALL UTILITY INTERRUPTIONS WITH THE OWNER AT LEAST 4 WEEKS PRIOR TO THE SHUTDOWN.

| Relay # | Circuit | Description | LV Switch/Sensor | DIMMING |
|---------|----------|------------------|------------------|---------|
| 1 | PP-2A-11 | FIXTURE TYPE XA | PHOTOCELL | NO |
| 2 | PP-2A-11 | FIXTURE TYPE XB2 | PHOTOCELL | YES |
| 3 | PP-2A-15 | FIXTURE TYPE XB4 | PHOTOCELL | YES |
| 4 | PP-2A-13 | FIXTURE TYPE XH | PHOTOCELL | NO |
| 5 | - | SPARE | - | - |
| 6 | - | SPARE | - | - |
| 7 | - | SPARE | - | - |
| 8 | - | SPARE | - | - |

*CONTRACTOR SHALL COORDINATE SCHEDULE WITH THE OWNER.

02 LIGHTING CONTROL
SU1.1 PANEL SCHEDULE



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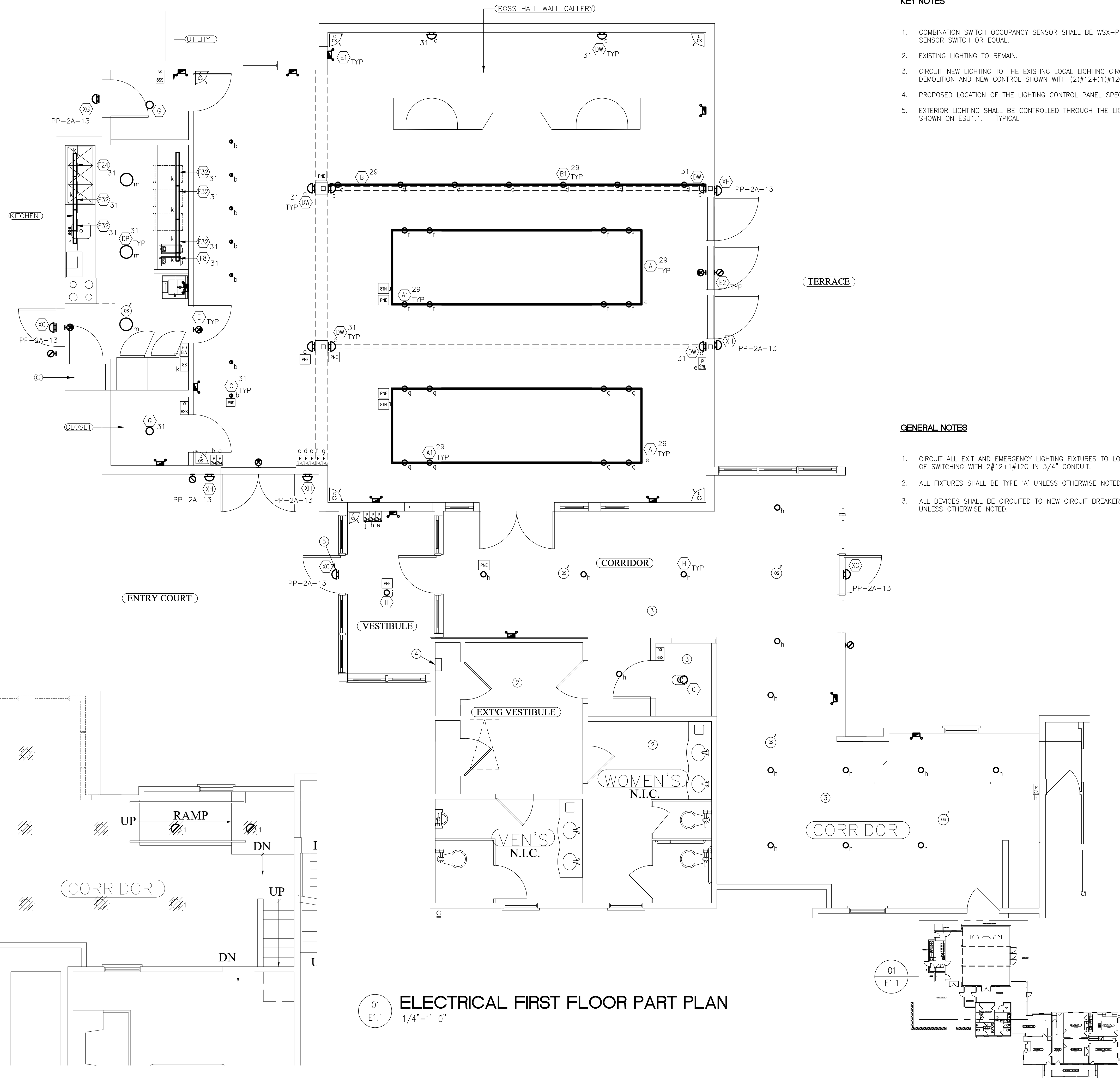
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MIDDLESEX COUNTY, NEW JERSEY

SU1.1

LEGEND

- PJ2-2BRL-GWH-L01 (CW-1-WH) (11)
- LRF2-OCR2B-P (3)
- LRF2-OKLB-P (7)
- MRF2S-6ELV120-WH (1)
- MRF2S-8S-DV-WH (1)
- MRF2S-8SSV-WH (2)
- RMJS-8TN-DV-B (2)
- RMJS-PNE-DV (8)



KEY NOTES

1. COMBINATION SWITCH OCCUPANCY SENSOR SHALL BE WSX-PDT AS MANUFACTURED BY SENSOR SWITCH OR EQUAL.
2. EXISTING LIGHTING TO REMAIN.
3. CIRCUIT NEW LIGHTING TO THE EXISTING LOCAL LIGHTING CIRCUIT LEFT SPARE AFTER DEMOLITION AND NEW CONTROL SHOWN WITH (2)#12+(1)#12G-3/4".
4. PROPOSED LOCATION OF THE LIGHTING CONTROL PANEL SPECIFIED ON DRAWING ESU1.1.
5. EXTERIOR LIGHTING SHALL BE CONTROLLED THROUGH THE LIGHTING CONTROL PANEL AS SHOWN ON ESU1.1. TYPICAL

GENERAL NOTES

1. CIRCUIT ALL EXIT AND EMERGENCY LIGHTING FIXTURES TO LOCAL LIGHTING CIRCUIT AHEAD OF SWITCHING WITH 2#12+1#12G IN 3/4" CONDUIT.
2. ALL FIXTURES SHALL BE TYPE 'A' UNLESS OTHERWISE NOTED.
3. ALL DEVICES SHALL BE CIRCUITED TO NEW CIRCUIT BREAKER IN NEW PANEL PP-2BB UNLESS OTHERWISE NOTED.

01
E1.1
ELECTRICAL FIRST FLOOR PART PLAN
1/4"=1'-0"

02
E1.1
ELECTRICAL DEMOLITION FLOOR PART PLAN
1/4"=1'-0"

03
E1.1
FIRST FLOOR KEY PLAN
1/32"=1'-0"



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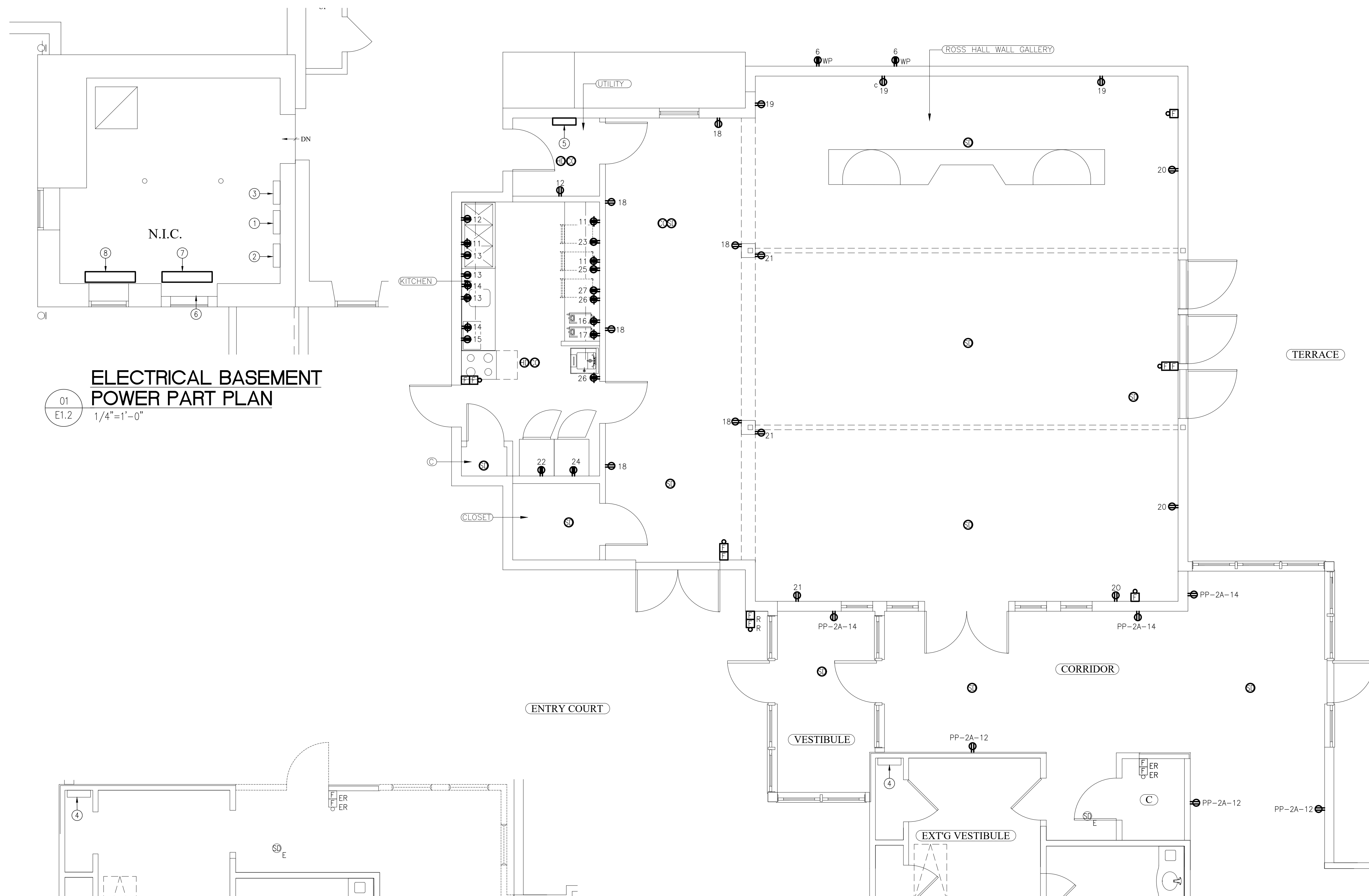
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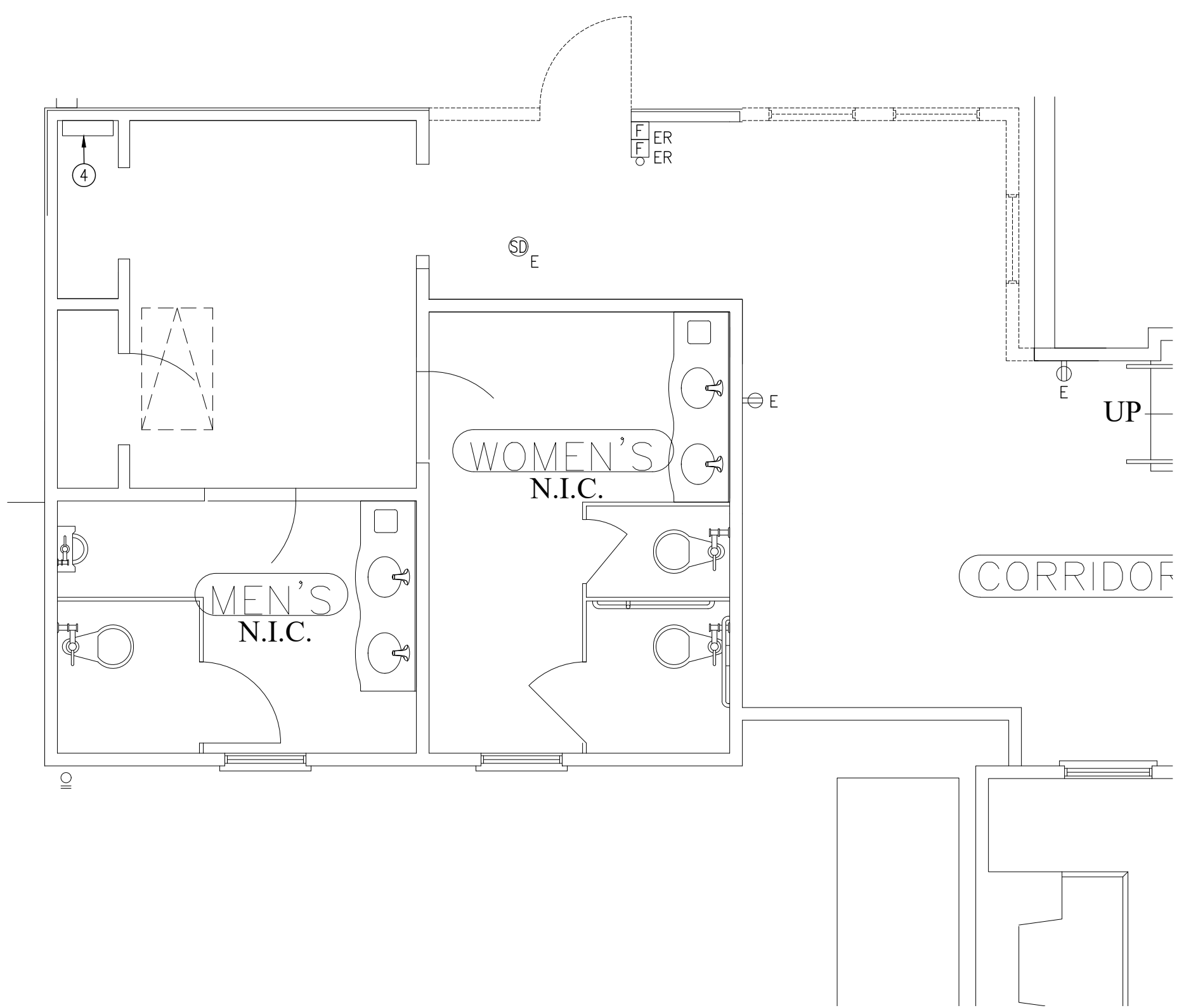
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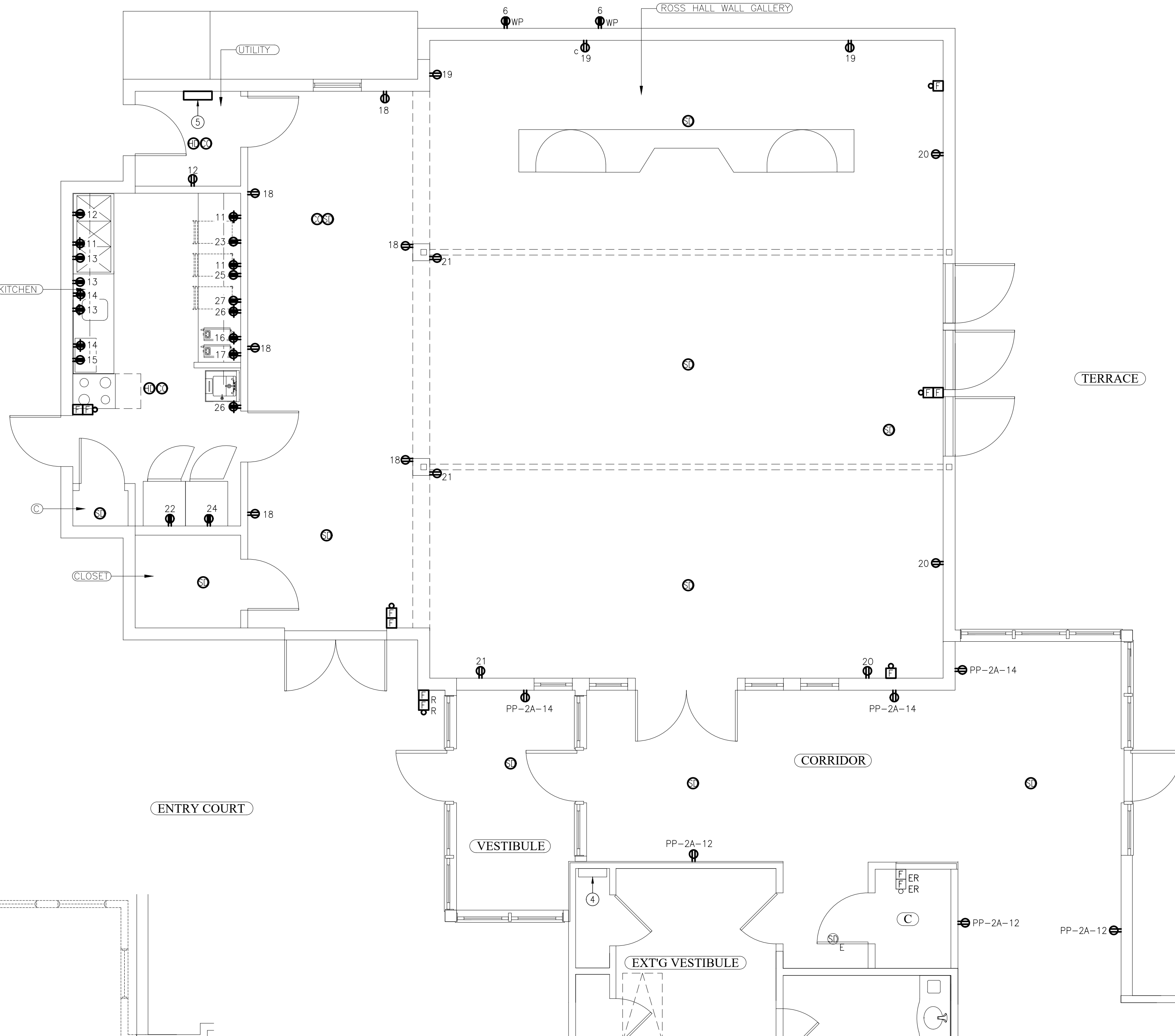
E1.1



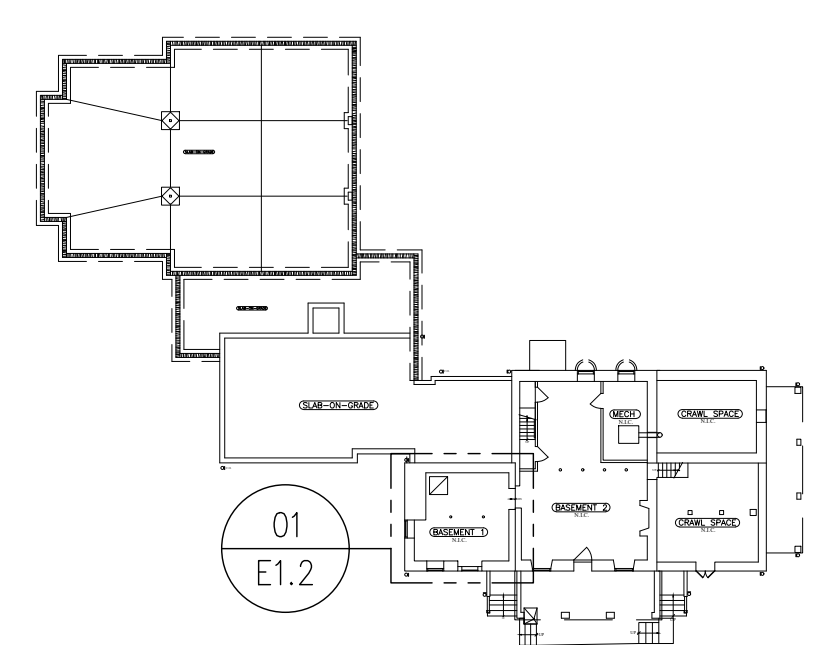
01
E1.2
ELECTRICAL BASEMENT POWER PART PLAN
1/4"=1'-0"



03
E1.2
ELECTRICAL DEMOLITION FIRST FLOOR PART PLAN
1/4"=1'-0"



02
E1.2
ELECTRICAL FIRST FLOOR POWER PART PLAN
1/4"=1'-0"



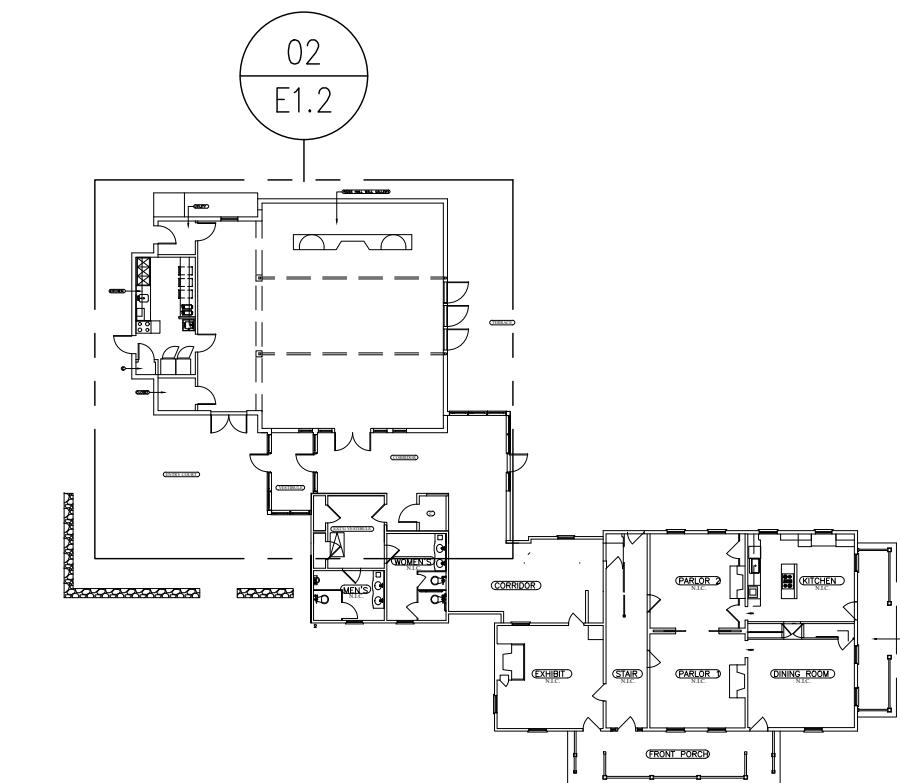
04
E1.2
BASEMENT KEY PLAN
1/32"=1'-0"

KEY NOTES

- EXISTING 200A, 208/120V, 1Ø, 3W PANEL PL LOCATED IN THE BASEMENT TO REMAIN.
- EXISTING 150A, 208/120V, 3Ø, 4W PANEL PP LOCATED IN THE BASEMENT TO REMAIN.
- EXISTING HONEYWELL IFP-75 FIRE ALARM PANEL.
- EXISTING PANEL PP-2A TO REMAIN.
- PROPOSED LOCATION OF PANEL PP-2B.
- EXISTING ELECTRICAL SERVICE ENTRANCE AS WELL AS CT AND METER SHALL BE REMOVED. THE NEW 600A MDP SHALL BE INSTALLED IN THE AREA LEFT SPARE AFTER THE REMOVAL OF THE CT AND METER.
- PROPOSED LOCATION OF THE NEW 600A, MDP.
- PROPOSED LOCATION OF THE NEW CT AND METER.

GENERAL NOTES

- ALL DEVICES SHALL BE CIRCUITED TO NEW CIRCUIT BREAKER IN NEW PANEL PP-2B UNLESS OTHERWISE NOTED.



05
E1.2
FIRST FLOOR KEY PLAN
1/32"=1'-0"



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**RESTORATION & EXPANSION
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TOWNSHIP OF PISCATAWAY
MIDDLESEX COUNTY, NEW JERSEY**

E1.2

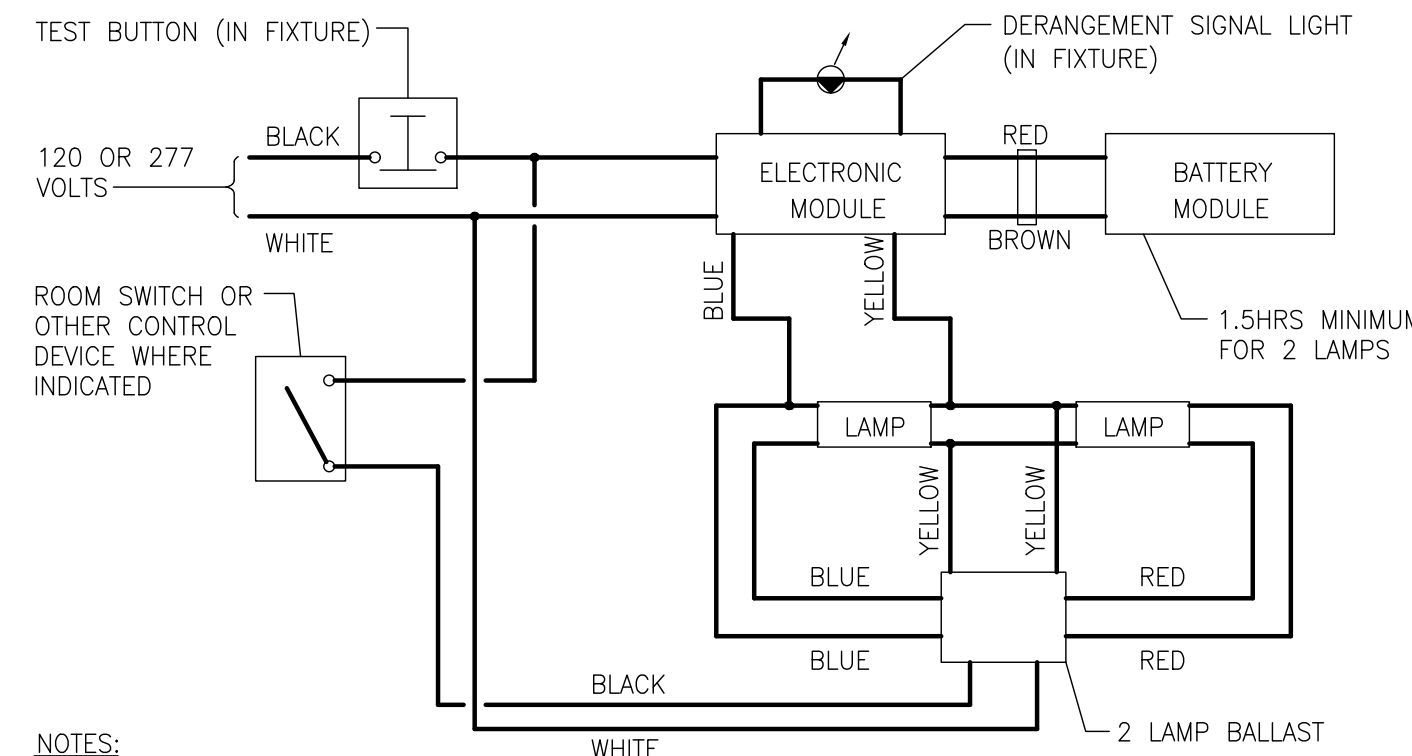
| PANEL MDP | | SCHEDULE | | COMMENTS | | NEW PANEL | | 600A MAIN CIRCUIT BREAKER | | | | | | | |
|----------------|----------------|------------------------|-------------------|----------------|----------|-----------------------------------|---------|---------------------------|----------|--------|------------------|--------------|----------------|---|--|
| PANEL LOCATION | | BASEMENT | | | | | | NUMBER OF POLES: 42 | | | | | | | |
| 208/120V | | VOLTS, 3 PHASE, 4 WIRE | | 600A BUS SIZE | | PANEL SHORT CIRCUIT RATING: 7,000 | | KALC | | | | | | | |
| C.B. POLE NO. | C.B. TRIP AMPS | C.B. LOAD VA | LOAD DESCRIPTION | CIR NO | FDR DATA | PHASE A | PHASE B | PHASE C | FDR DATA | CIR NO | LOAD DESCRIPTION | C.B. LOAD VA | C.B. TRIP AMPS | C.B. POLE NO. | |
| 1 | 15,833 | 3,250 | WH-1 | 1 | 2 | 8 | 10 | 1 | 4114 | 2 | 12 | 12 | 3/4 | 2 | |
| 3 | 150 | 20,492 | EXISTING PANEL PP | 3 | 4 | 1/0 | 6 | 2 | 23823 | 27336 | 16709 | 4 | 3/0 | 6 | |
| 5 | 15,833 | 3,250 | WH-1 | 5 | 2 | 8 | 10 | 1 | 4114 | 2 | 12 | 12 | 3/4 | 2 | |
| 7 | 15,833 | 3,250 | WH-1 | 7 | 2 | 8 | 10 | 1 | 4114 | 2 | 12 | 12 | 3/4 | 2 | |
| 9 | 15,833 | 3,250 | WH-1 | 9 | 2 | 8 | 10 | 1 | 4114 | 2 | 12 | 12 | 3/4 | 2 | |
| 11 | 15,833 | 3,250 | WH-1 | 11 | 2 | 8 | 10 | 1 | 4114 | 2 | 12 | 12 | 3/4 | 2 | |
| 13 | | | SPACE | 13 | | | | | | | | | | | |
| 15 | | | SPACE | 15 | | | | | | | | | | | |
| 17 | | | SPACE | 17 | | | | | | | | | | | |
| 19 | | | SPACE | 19 | | | | | | | | | | | |
| 21 | | | SPACE | 21 | | | | | | | | | | | |
| 23 | | | SPACE | 23 | | | | | | | | | | | |
| 25 | | | SPACE | 25 | | | | | | | | | | | |
| 27 | | | SPACE | 27 | | | | | | | | | | | |
| 29 | | | SPACE | 29 | | | | | | | | | | | |
| 31 | | | SPACE | 31 | | | | | | | | | | | |
| 33 | | | SPACE | 33 | | | | | | | | | | | |
| 35 | | | SPACE | 35 | | | | | | | | | | | |
| 37 | | | SPACE | 37 | | | | | | | | | | | |
| 39 | | | SPACE | 39 | | | | | | | | | | | |
| 41 | | | SPACE | 41 | | | | | | | | | | | |
| MOUNTING: | | SURFACE | | PH-LOAD | | 39189 | | 46073 | | 36977 | | VA | | PANEL TYPE : NEMA 1, WITH GROUNDING TERMINAL 100% NEUTRAL | |
| FED FROM: | | EXISTING PANEL | | CONNECTED LOAD | | 122 | | KVA | | 340 | | AMPS | | | |

| PANEL PP-2B | | SCHEDULE | | COMMENTS | | NEW PANEL | | 200A MAIN CIRCUIT BREAKER | | | | | | | |
|----------------|----------------|------------------------|----------------------|----------------|----------|--------------------------------|---------|---------------------------|----------|--------|------------------|--------------|----------------|---|--|
| PANEL LOCATION | | UTILITY ROOM | | | | | | NUMBER OF POLES: 24 | | | | | | | |
| 208/120V | | VOLTS, 3 PHASE, 4 WIRE | | 200A BUS SIZE | | PANEL SHORT CIRCUIT RATING: 24 | | KALC | | | | | | | |
| C.B. POLE NO. | C.B. TRIP AMPS | C.B. LOAD VA | LOAD DESCRIPTION | CIR NO | FDR DATA | PHASE A | PHASE B | PHASE C | FDR DATA | CIR NO | LOAD DESCRIPTION | C.B. LOAD VA | C.B. TRIP AMPS | C.B. POLE NO. | |
| 2 | 40 | 3,250 | WH-1 | 1 | 2 | 8 | 10 | 1 | 4114 | 2 | 12 | 12 | 3/4 | 2 | |
| 3 | 25 | 2,208 | AHU-1 | 3 | 2 | 10 | 10 | 3/4 | 5458 | 2 | 10 | 10 | 3/4 | 4 | |
| 5 | 25 | 2,208 | AHU-2 | 5 | 2 | 10 | 10 | 3/4 | 2928 | 2 | 12 | 12 | 3/4 | 4 | |
| 7 | 25 | 2,208 | AHU-2 | 7 | 2 | 10 | 10 | 3/4 | 3072 | 2 | 12 | 12 | 3/4 | 6 | |
| 9 | 20 | 375 | WH-1 | 9 | 2 | 12 | 12 | 3/4 | 1239 | 2 | 12 | 12 | 3/4 | 10 | |
| 11 | 20 | 540 | KITCHEN COUNTER RECS | 11 | 2 | 12 | 12 | 3/4 | 900 | 2 | 12 | 12 | 3/4 | 12 | |
| 13 | 20 | 540 | KITCHEN RECS | 13 | 2 | 12 | 12 | 3/4 | 2040 | 2 | 12 | 12 | 3/4 | 14 | |
| 15 | 20 | 1,500 | KITCHEN RECS | 15 | 2 | 12 | 12 | 3/4 | 2820 | 2 | 12 | 12 | 3/4 | 16 | |
| 17 | 20 | 1,320 | COFFEE MAKER | 17 | 2 | 12 | 12 | 3/4 | 1860 | 2 | 12 | 12 | 3/4 | 18 | |
| 19 | 20 | 540 | GALLERY RECS | 19 | 2 | 12 | 12 | 3/4 | 1080 | 2 | 12 | 12 | 3/4 | 20 | |
| 21 | 20 | 540 | GALLERY RECS | 21 | 2 | 12 | 12 | 3/4 | 1140 | 2 | 12 | 12 | 3/4 | 22 | |
| 23 | 20 | 600 | ICE MACHINE 1 | 23 | 2 | 12 | 12 | 3/4 | 1200 | 2 | 12 | 12 | 3/4 | 24 | |
| 25 | 20 | 600 | ICE MACHINE 2 | 25 | 2 | 12 | 12 | 3/4 | 960 | 2 | 12 | 12 | 3/4 | 26 | |
| 27 | 20 | 600 | ICE MACHINE 3 | 27 | 2 | 12 | 12 | 3/4 | 800 | 2 | 12 | 12 | 3/4 | 28 | |
| 29 | 20 | 960 | TRACK LIGHTING | 29 | 2 | 12 | 12 | 3/4 | 2460 | 2 | 12 | 12 | 3/4 | 30 | |
| 31 | 20 | 460 | INTERIOR LIGHTING | 31 | 2 | 12 | 12 | 3/4 | 460 | 2 | 12 | 12 | 3/4 | 32 | |
| 33 | 20 | | SPACE | 33 | | | | | | | | | | | |
| 35 | 20 | | SPACE | 35 | | | | | | | | | | | |
| 37 | 20 | | SPACE | 37 | | | | | | | | | | | |
| 39 | 20 | | SPACE | 39 | | | | | | | | | | | |
| 41 | 50 | 3,640 | ACCU-1 | 39 | 2 | 8 | 10 | 1 | 3640 | 2 | 8 | 10 | 1 | 1 | |
| 42 | 50 | 3,640 | ACCU-2 | 39 | 2 | 8 | 10 | 1 | 7280 | 2 | 8 | 10 | 1 | 2 | |
| 43 | 50 | 3,640 | ACCU-3 | 39 | 2 | 8 | 10 | 1 | 7280 | 2 | 8 | 10 | 1 | 3 | |
| 44 | 50 | 3,640 | ACCU-4 | 39 | 2 | 8 | 10 | 1 | 7280 | 2 | 8 | 10 | 1 | 4 | |
| MOUNTING: | | SURFACE | | PH-LOAD | | 15366 | | 18737 | | 20268 | | VA | | PANEL TYPE : NEMA 1, WITH GROUNDING TERMINAL 100% NEUTRAL | |
| FED FROM: | | EXISTING PANEL | | CONNECTED LOAD | | 54 | | KVA | | 151 | | AMPS | | | |

| PANEL PP-2A | | SCHEDULE | | COMMENTS | | EXISTING PANEL | | 125A MLO | | | | | | | |
|----------------|----------------|------------------------|----------------------------|----------------|----------|--------------------------------|---------|---------------------|----------|--------|------------------|--------------|----------------|---|--|
| PANEL LOCATION | | BASEMENT FLOOR | | | | | | NUMBER OF POLES: 42 | | | | | | | |
| 208/120V | | VOLTS, 3 PHASE, 4 WIRE | | 125A BUS SIZE | | PANEL SHORT CIRCUIT RATING: 10 | | KALC | | | | | | | |
| C.B. POLE NO. | C.B. TRIP AMPS | C.B. LOAD VA | LOAD DESCRIPTION | CIR NO | FDR DATA | PHASE A | PHASE B | PHASE C | FDR DATA | CIR NO | LOAD DESCRIPTION | C.B. LOAD VA | C.B. TRIP AMPS | C.B. POLE NO. | |
| 1 | 20 | 585 | BATHROOM ADDITION LIGHTING | 1 | 2 | 12 | 12 | 3/4 | 783 | 2 | 12 | 12 | 3/4 | 2 | |
| 3 | 20 | 720 | BATHROOM ADDITION REC | 3 | 2 | 12 | 12 | 3/4 | 1004 | 2 | 12 | 12 | 3/4 | 4 | |
| 5 | 20 | 720 | ADDITION REC | 5 | 2 | 12 | 12 | 3/4 | 1004 | 2 | 12 | 12 | 3/4 | 6 | |
| 7 | 20 | 1,500 | HAND DRYER | 7 | 2 | 12 | 12 | 3/4 | 4412 | 2 | 8 | 10 | 1 | 8 | |
| 9 | 20 | 1,500 | HAND DRYER | 9 | 2 | 12 | 12 | 3/4 | 4412 | 2 | 12 | 12 | 3/4 | 10 | |
| 11 | 20* | 77 | SITE LIGHTING | 11 | 2 | 10 | 10 | | 617 | 2 | 12 | 12 | 3/4 | 12 | |
| 13 | 20* | 80 | SITE LIGHTING | 13 | 2 | 10 | 10 | 3/4 | 80 | 2 | 12 | 12 | 3/4 | 14 | |
| 15 | 20* | 88 | SITE LIGHTING | 15 | 2 | 10 | 10 | 3/4 | 88 | 2 | 12 | 12 | 3/4 | 16 | |
| 17 | 20* | 200 | LIGHTING CONTROL PANEL | 17 | 2 | 12 | 12 | 3/4 | 200 | 2 | 12 | 12 | 3/4 | 18 | |
| 19 | | | SPACE | 19 | | | | | | | | | | | |
| 21 | | | SPACE | 21 | | | | | | | | | | | |
| 23 | | | SPACE | 23 | | | | | | | | | | | |
| 25 | | | SPACE | 25 | | | | | | | | | | | |
| 27 | | | SPACE | 27 | | | | | | | | | | | |
| 29 | | | SPACE | 29 | | | | | | | | | | | |
| 31 | | | SPACE | 31 | | | | | | | | | | | |
| 33 | | | SPACE | 33 | | | | | | | | | | | |
| 35 | | | SPACE | 35 | | | | | | | | | | | |
| 37 | | | SPACE | 37 | | | | | | | | | | | |
| 39 | 40 | 3,250 | WH-1 | 39 | 2 | 8 | 10 | 1 | 6500 | 2 | 8 | 10 | 1 | 1 | |
| 41 | 40 | 3,250 | WH-2 | 39 | 2 | 8 | 10 | 1 | 6500 | 2 | 8 | 10 | 1 | 2 | |
| MOUNTING: | | SURFACE | | PH-LOAD | | 5275 | | 12004 | | 8321 | | VA | | PANEL TYPE : NEMA 1, WITH GROUNDING TERMINAL 100% NEUTRAL | |
| FED FROM: | | EXISTING PANEL | | CONNECTED LOAD | | 26 | | KVA | | 71 | | AMPS | | | |

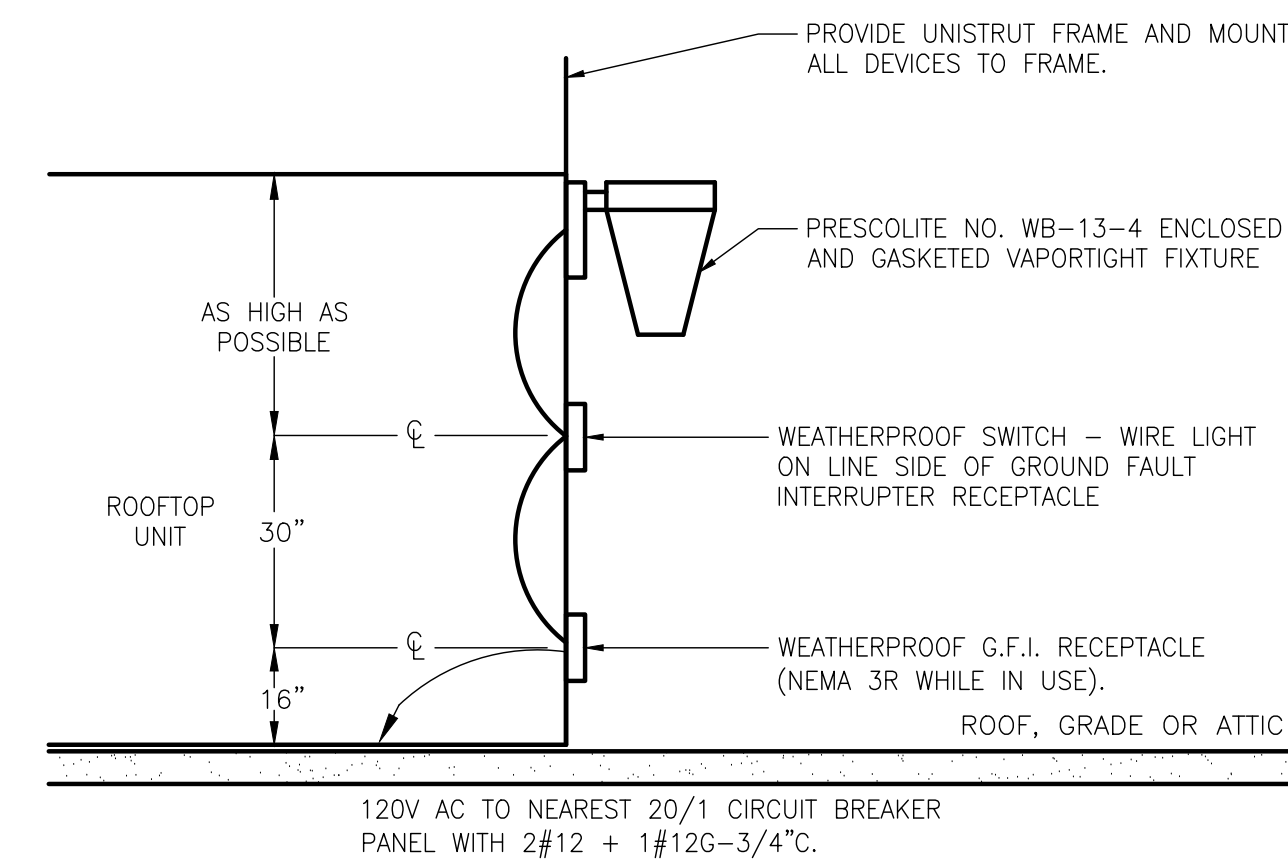
*PROVIDE AND INSTALL A NEW CIRCUIT BREAKER TO MATCH EXISTING.

01 ELECTRICAL PANEL SCHEDULE
E2.1 NONE



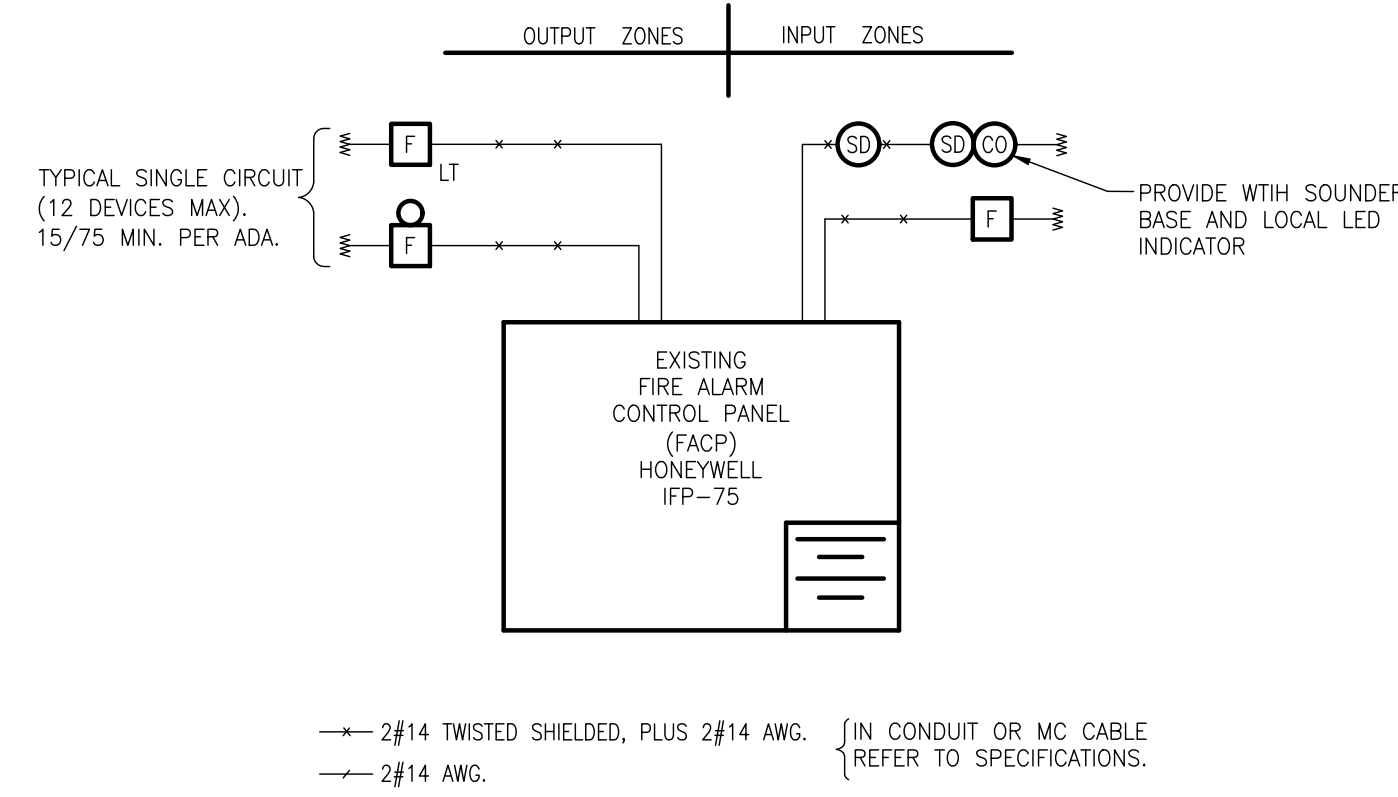
- NOTES:
- WHERE INDICATED ON DRAWINGS THAT A FIXTURE IS CONTROLLED BY A LOCAL SWITCH, FIXTURE SHALL BE WIRED TO SHUT OFF WHEN SWITCH IS OFF. BATTERY MODULE IS ALWAYS HOT.
 - TWO LAMP FIXTURES = BOTH LAMPS ARE EMERGENCY
THREE LAMP FIXTURES = OUTER LAMPS ARE EMERGENCY
FOUR LAMP FIXTURES = TWO CENTER LAMPS ARE EMERGENCY
 - REFER TO MANUFACTURER'S WIRING DIAGRAM FOR ACTUAL CONDUCTOR SIZES.
 - WHERE LIGHTING CONTROL SYSTEM IS APPLIED, THE BATTERY BALLAST MUST BE WIRED AHEAD OF SYSTEM RELAY.

05 EMERGENCY LIGHTING WIRING DIAGRAM
E2.1 NONE



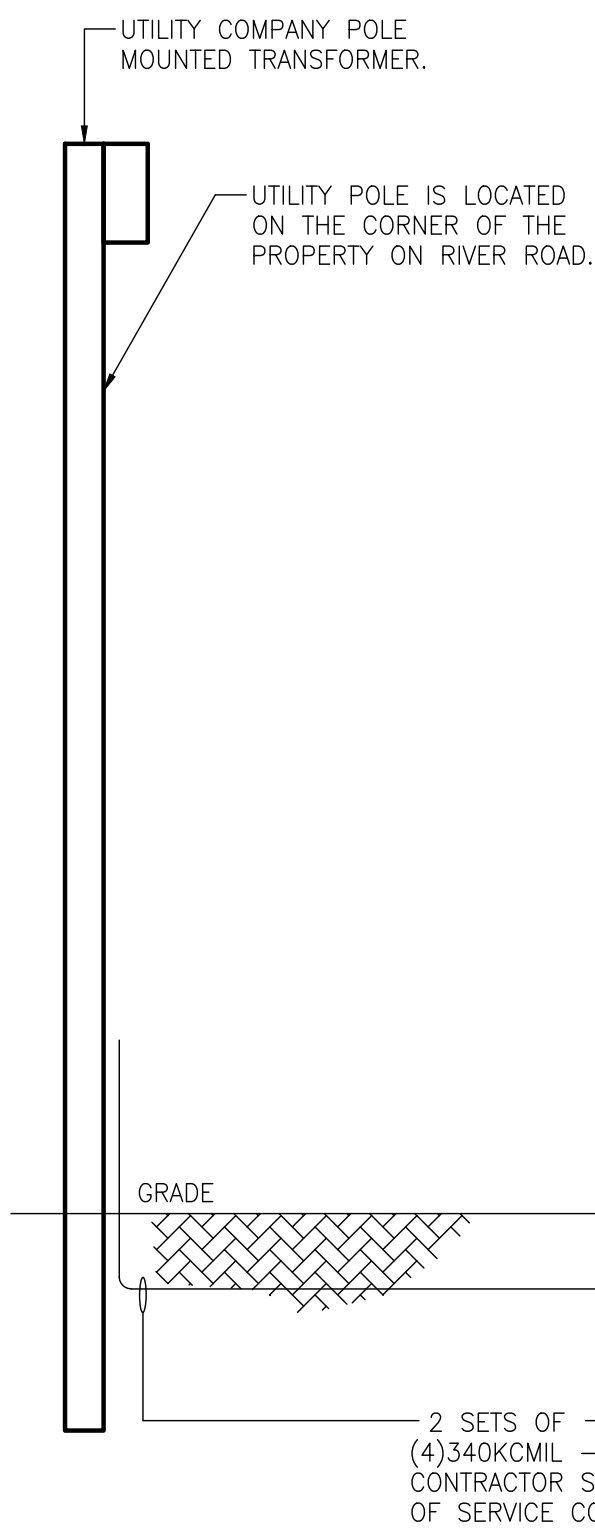
NOTE: LIGHT FIXTURE AND SWITCH NOT REQUIRED ON UNIT WHERE GRADE OR ATTIC MOUNTED. SEE SITE AND FLOOR PLANS FOR APPLICABLE LIGHTING.

TYPICAL LIGHTING AND CONVENIENCE POWER AT HVAC EQUIPMENT
E2.1 NONE

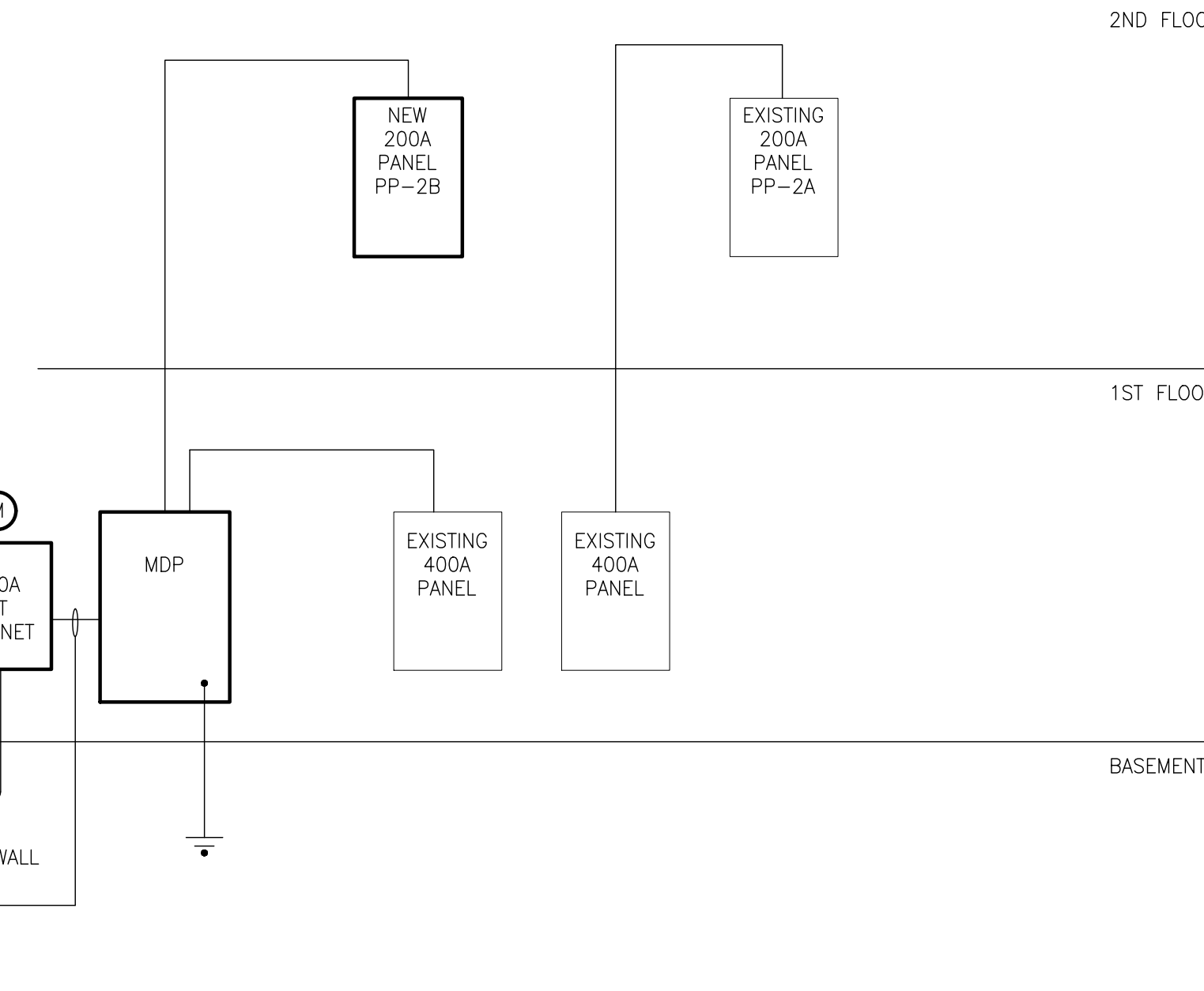


- NOTES:
- A/V LOCATION AND SPACING SHALL ADHERE TO NFPA 72.
 - INSTALLATION SHALL BE IN ACCORDANCE TO THE LATEST ADOPTED EDITION OF NFPA 72.

02 FIRE ALARM RISER
E2.1 NONE

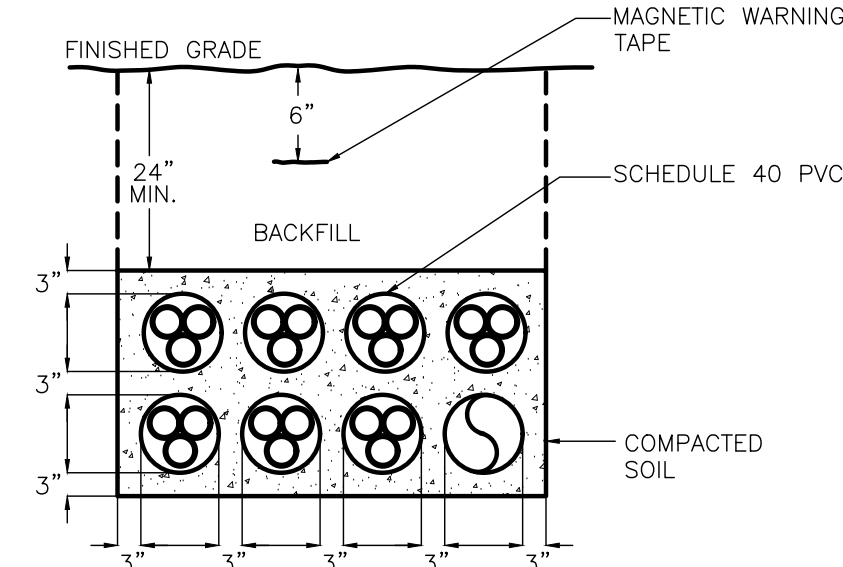


04 ELECTRICAL RISER DIAGRAM
E2.1 NONE



- NOTES:
- DETAIL IS FOR GENERAL INSTALLATION AND NOT FOR QUANTITY OR SIZE OF CONDUITS. SEE SINGLE LINE DRAWING. ALWAYS PROVIDE ONE SPARE CONDUIT WITHIN DUCTBANK.

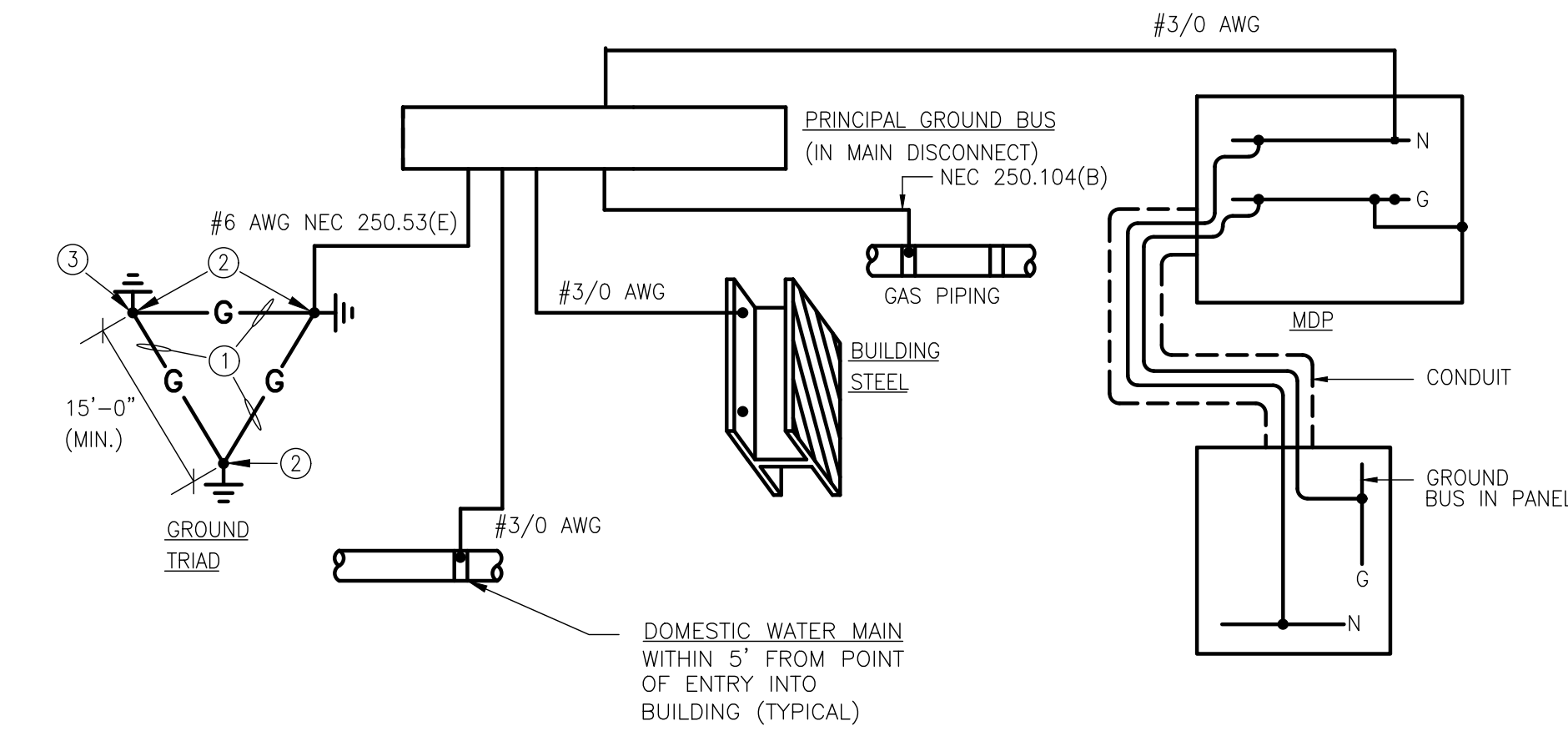
08 SECONDARY DUCT BANK DETAIL
E2.1 NONE



NOTE: LIGHT FIXTURE AND SWITCH NOT REQUIRED ON UNIT WHERE GRADE OR ATTIC MOUNTED. SEE SITE AND FLOOR PLANS FOR APPLICABLE LIGHTING.

- NOTES:
- DETAIL IS FOR GENERAL INSTALLATION AND NOT FOR QUANTITY OR SIZE OF CONDUITS. SEE SINGLE LINE DRAWING. ALWAYS PROVIDE ONE SPARE CONDUIT WITHIN DUCTBANK.

08 SECONDARY DUCT BANK DETAIL
E2.1 NONE



- GENERAL NOTES:
- THE GROUNDING SYSTEM IS DESIGNED FOR A MAXIMUM OF 25 OHMS WHEN MEASURED FROM THE GROUND BUS TO THE SINGLE POINT GROUND LOCATED OUTSIDE OF THE BUILDING ENVELOPE.
 - GROUNDING SHOWN SHALL BE IN ACCORDANCE WITH THE LATEST ADOPTED EDITION OF THE N.E.C. ARTICLE 250.
 - BOND ACROSS WATER METERS, ETC.
- KEY NOTES:
- 3/0 COPPER WIRE.
 - CADWELD CONNECTION.
 - COPPERCLAD GROUND ROD. 3/4"x10' LOCATED 18" MINIMUM BELOW FINISHED GRADE.(TYPICAL) U.O.N.

03 TYPICAL GROUNDING SYSTEM FROM SERVICE ENTRANCE
E2.1 NONE

CONNOLLY & HICKEY
HISTORICAL ARCHITECTS, LLC
P.O. Box 1726
Cranford, N.J. 07016
973 746-4911

THOMAS B. CONNOLLY, AIA
NJ 21A101699200
MARGARET M. HICKEY, RA
NJ 21A101824500

PROJECT No.: 1836C
DATE: 30 JUNE 2021

REVISIONS:

DRAWN BY: AIC

RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
TOWNSHIP OF PISCATAWAY
MIDDLESEX COUNTY, NEW JERSEY

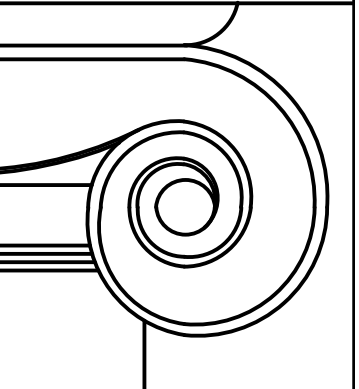
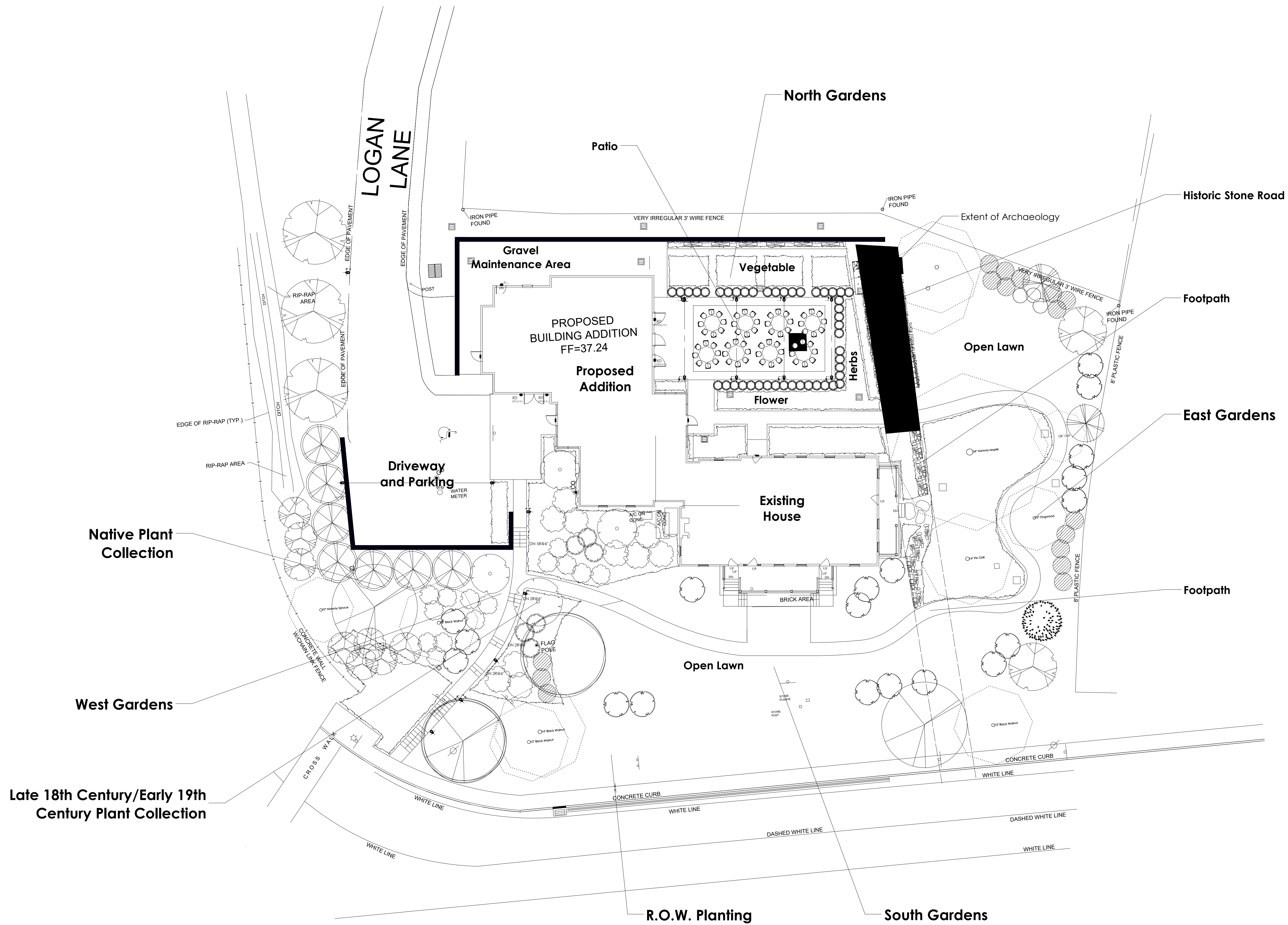
KSI CONSULTING ENGINEERS, LLC
ADDRESS:
P.O. BOX 628 FARMINGDALE, NJ 07727
PHONE: 732.938.2666
FAX: 732.938.2521
CERTIFICATE OF AUTHORIZATION NO. 24GA28124300

ALL DRAWINGS AND WRITTEN MATERIALS APPEARING HEREON CONSTITUTE ORIGINAL AND UNPUBLISHED WORK OF THE ENGINEER. THE REPRODUCTION OF THIS DRAWING FOR THE PURPOSE OF COPYING THE WORK OR EXISTING SAID DRAWING SHALL BE CONSIDERED A VIOLATION OF BOTH THE PROFESSIONAL CODE OF ETHICS AND A TRUST OF COMPANY ASSETS, BOTH OF WHICH SHALL BE PROSECUTED TO THE FULLEST EXTENT OF CURRENT STATUTES.

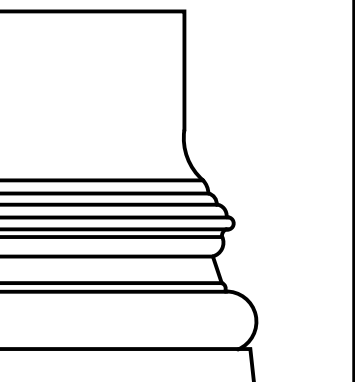
James Sarro Jr., P.E.
Professional Engineer
State of New Jersey

DATE:
NEW JERSEY PROFESSIONAL ENGINEER
LICENSE NUMBER: 451900

E2.1



CONNOLLY & HICKEY
 HISTORICAL
 ARCHITECTS, LLC
 P.O. Box 1726
 Cranford, N.J. 07016
 973 746-4911



THOMAS B. CONNOLLY, AIA
 NJ 21A0169200
 PA RA403776
 MARGARET M. HICKEY, AIA
 NJ 21A018244500

PROJECT No.: 1836C
 DATE: 30 JUNE 2021
 REVISIONS:

DRAWN BY: TBC, MMH, MS

RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
 TOWNSHIP OF PISCATAWAY
 MIDDLESEX COUNTY, NEW JERSEY

X1



1
X1

SITE LIGHTING PLAN

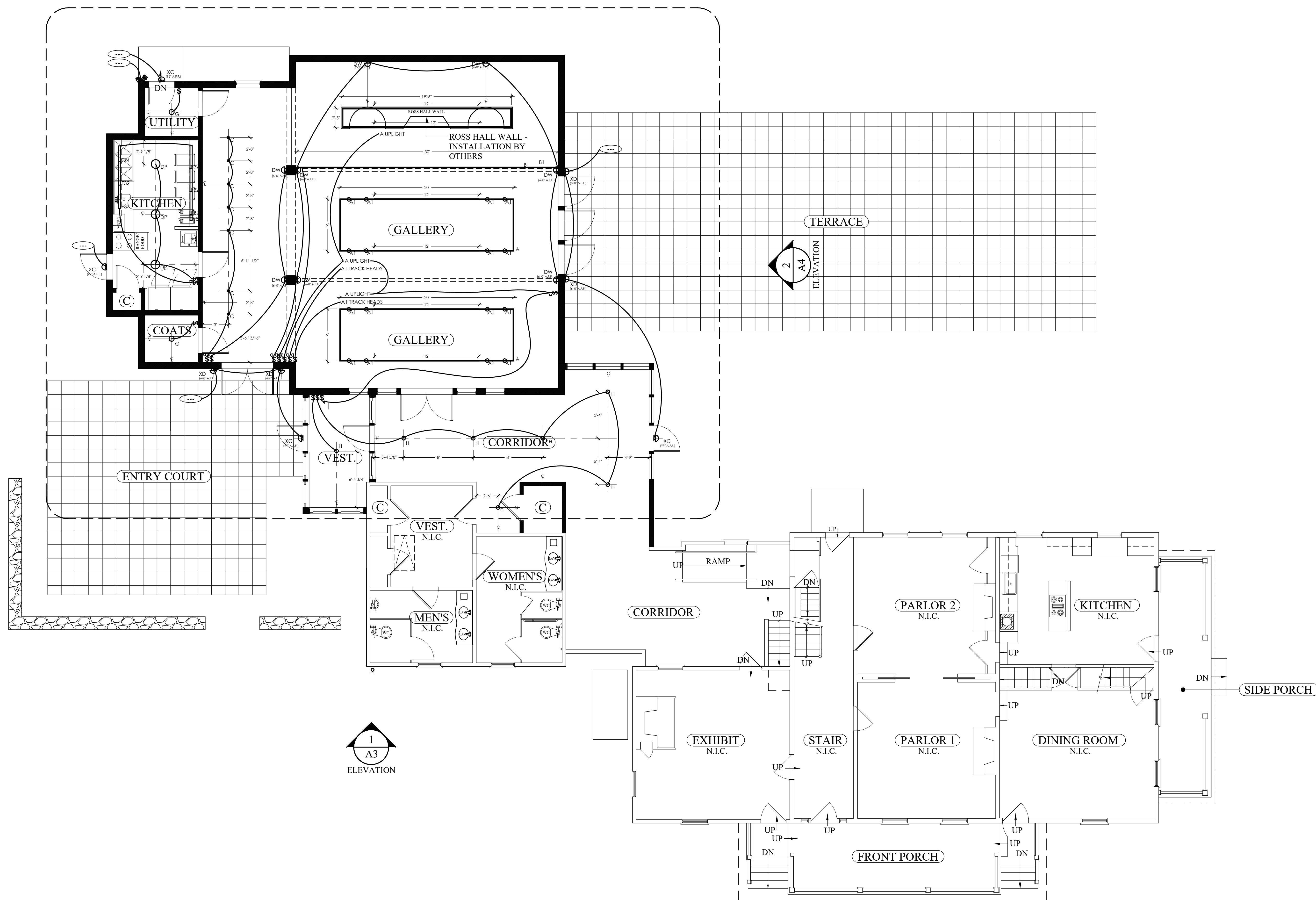
1" = 15' - 0"

ELEVATION

1
A4

ELEVATION

2
A3



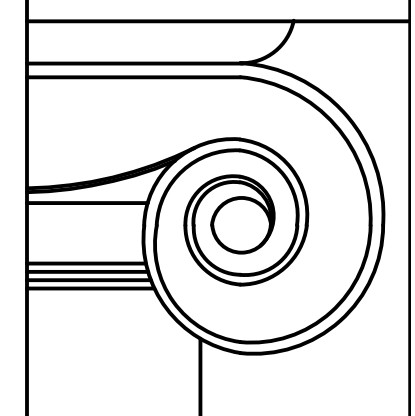
1
A3
ELEVATION



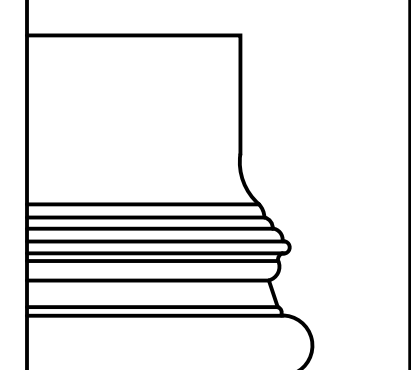
1
X2

FIRST FLOOR LIGHTING PLAN

3/16" = 1" 0"



CONNOLLY & HICKEY
 HISTORICAL ARCHITECTS, LLC
 P.O. Box 1726
 Cranford, N.J. 07016
 973 746-4911



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 NJ 21A101699200
 PA RA403776
 MARGARET M. HICKEY, AIA
 NJ 21A1018244500

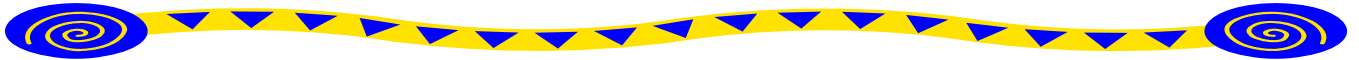
PROJECT No. : 1836C
 DATE : 30 JUNE 2021
 REVISIONS :

DRAWN BY: TBC, MMH, MS

RESTORATION & EXPANSION
HISTORIC METLAR-BODINE HOUSE
 TOWNSHIP OF PISCATAWAY
 MIDDLESEX COUNTY, NEW JERSEY

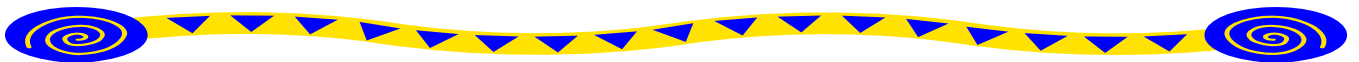
X2

THE TOWNSHIP OF PISCATAWAY



PROPOSAL SHEETS

Page 1-3



MARIA E. VALENTE-CAEMMERER

Purchasing Agent

PROPOSAL FORM

BIDDER NAME: _____

BIDDER ADDRESS: _____

BIDDER PHONE/FAX/E-MAIL: _____

PROJECT NAME: **RESTORATION AND EXPANSION AT THE HISTORIC METLAR-BODINE HOUSE**

PROJECT LOCATION: 1281 River Road, Piscataway, New Jersey 08854

SCOPE OF WORK:

Scope: Work involves two project components. The first is the expansion of the existing Historic Metlar-Bodine House to create an accessible entrance and to provide additional exhibit and support space including but not limited to site upgrades including parking, retaining walls, walks, exterior stairs and related work, and the complete fit and finish of the addition including foundations, framing, structural steel, roofing, siding, windows, doors, flooring, wall and ceiling finishes, wood trim, kitchen equipment, electrical and exterior and interior lighting, heating, air conditioning, ventilation, plumbing and related work items. The second is the exterior repair and painting of the Metlar-Bodine House including siding, trim, window repair, shutters, and surface preparation and painting.

BID PROPOSAL:

The undersigned has reviewed the proposal submitted in response to the bid issued by the Township of Piscataway in connection with the need for the **RESTORATION AND EXPANSION AT THE HISTORIC METLAR-BODINE HOUSE:**

We affirm that the contents of the proposal (which proposal is incorporated herein by reference) is accurate, factual and complete to the best of our knowledge and belief and that the proposal is submitted in good faith upon express understanding that any false statements may result in the disqualification of our proposal.

The undersigned hereby agrees to furnish all labor, materials, supplies, supervision, equipment and other means as necessary to perform all the work and furnish all the materials in accordance with the Specifications at the following prices within the time constraints of General conditions:

The Township will award to the lowest responsible bidder based upon the following Base Bid (subject to the bidder meeting all other requirements in these specifications). The Township also reserves the right to reject all bids as per the stipulations in these specifications.

(Include ALL amounts for general construction, electrical work, finishes, utilities, etc... for a complete final renovation as per the contract documents). Note: Where written words and numbers do not agree, written words shall prevail.

- 1. GENERAL REQUIREMENTS \$ _____
- 2. TEMPORARY FACILITIES \$ _____
- 3. DIVISION 2 – EXISTING CONDITIONS \$ _____
- 4. DIVISION 3 – CONCRETE \$ _____
- 5. DIVISION 4 – MASONRY \$ _____
- 6. DIVISION 5 – METALS \$ _____
- 7. DIVISION 6 – WOODS & PLASTICS \$ _____
- 8. DIVISION 7 – THERMAL & MOISTURE PROTECTION \$ _____
- 9. DIVISION 8 – DOORS AND WINDOWS \$ _____
- 10. DIVISION 9 – FINISHES \$ _____
- 11. DIVISION 22 – PLUMBING \$ _____
- 12. DIVISION 23 - Heating, Ventilating, and Air Conditioning (HVAC) \$ _____
- 13. DIVISION 26 - ELECTRICAL \$ _____
- 14. DIVISION 27 - 28 – COMMUNICATIONS/LIFE-SAFETY \$ _____
- 15. DIVISION 31 – SITE WORK \$ _____
- 16. DIVISION 32 – EXTERIOR IMPROVEMENTS \$ _____
- 17. DIVISION 33 - UTILITIES \$ _____
- 18. GENERAL ALLOWANCES (See Drawings/Repairs at House) \$ _____

Dollars (\$ _____)

Base Bid _____

In words

BID ALTERNATES

- 1. BID ALTERNATE No. 1: Deduct the repair and exterior painting of the Metlar and Bodine sections of the complex. Refer to Sheets A22, A23, A24

DEDUCT: _____

- 2. BID ALTERNATE No. 2: Deduct the installation of the "bridge" between the rear yard and the side porch at the Metlar House including the installation of new railings to match historic as shown on the plans. Refer to Sheets SP1

DEDUCT: _____

- 3. BID ALTERNATE No. 3: Deduct the installation of new kitchen equipment in the proposed catering kitchen. Base work to remain should the deduct alternate be accepted is the rough plumbing stubbed through the finishes, floor, wall and ceiling finishes, and lighting with the exception of the undercabinet lighting. Refer to Sheets A18 and Plumbing Drawings.

DEDUCT: _____

Submitted By (Name of Firm) _____

Signature _____

Print Name _____

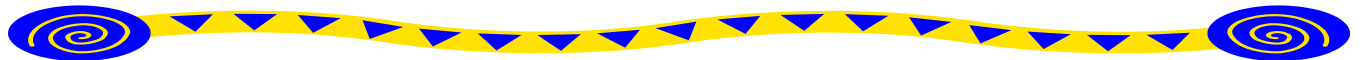
Title _____

Date _____

Bid No. 2021- 07-22

THE TOWNSHIP OF PISCATAWAY

THESE SAMPLE PAGES ARE **NOT** REQUIRED BACK WITH SEALED BID DOCUMENTS



SAMPLE-BID REQUIRED DOCUMENTS ONCE AWARD

All documents in this section must be submitted with the awarded Contract –These documents are **REQUIRED ONCE AWARDED ONLY.** Failure to submit the documents and other documents with the contract may be cause to reject the bid for being non-responsive.



MARIA E. VALENTE-CAEMMERER

Purchasing Agent/Township Secretary

To be completed, signed and returned with Bid

Sample: Required ONLY Once Awarded:

SAMPLE OF FORMS THAT WILL BE REQUIRED ONCE AWARDED

SAMPLE-AA-201
SAMPLE-AA-202
SAMPLE-W-9
SAMPLE-INSURANCE CERTIFICATE
SAMPLE-ST-13 FORM
SAMPLE-PERFORMANCE BOND FORM.

**Sample- AA-202- STATE OF NJ Dept. of Monthly Payroll
Forms**

**SAMPLE- WHD FORMS-U.S. DEPARTMENT OF
LABOR WEEKELY REPORT**

**Sample-W-9- May be submitted for faster
processed.**

**SAMPLE- ST-13 FORM- CONTRACTOR EXEMPT
FORM.**

SAMPLE: PERFORMANCE PAYMENT BOND FORM

**(ANY “AIA Payment Document” ARE NOT
ACCEPTABLE)**

**THESE SAMPLE PAGES DO NOT HAVE TO BE
RETURNED WITH BID.**

SAMPLE

TO CONTRACTOR:

Have your bonding company complete the enclosed Performance/Payment Bond. In order to expedite the process by which your Performance/Payment Bond will be approved by our township attorney, you must use the enclosed form. Please fill out the numbered highlighted areas and have all required signatures in place. The Township will not review any alternative forms and they will be returned to you.

Please fill out the highlighted areas numbered as follows:

1. Full name of Contractor
2. Indicate whether a Corporation, Partnership or Individual
- 3, 3A, 3B Full name of Bonding Company, State, and Office Address
4. Amount of contract in words and figures
5. Date of Bond (Supplied by bonding company - cannot be prior to date of contract)
6. Date of Contract (Found on first page of contract at top)
7. Title and/or description of contract
8. Full name of Contractor
9. Full name of Contractor
10. Same date as Item # 5

SAMPLE

Accompanying documents from the bonding company must include the following:

1. Financial Statement
 2. Surety Disclosure Statement and Certification
- A Power of Attorney should be provided for the individual executing the bond on behalf of the surety.

**PERFORMANCE PAYMENT BOND MUST BE SIGNED AND SEALED BY ALL
PARTIES INDICATED ON PAGE 2**

SAMPLE

Performance Payment Bond

PERFORMANCE PAYMENT BOND

Know all men by these presents, that we, **(1)** _____ a
(2) _____ the undersigned as Principal and
(3) _____ of the State of **(3A)** _____
 duly authorized to do business in the State of New Jersey, having an office at
(3B) _____, New Jersey, as Surety, are
 hereby held and firmly bound unto the Township of Piscataway, 455 Hoes Lane, Piscataway, New Jersey
 08854 in the penal sum of
(4) _____
 (\$ _____) DOLLARS,

for the payment of which well and truly to be made, we hereby jointly and severally bind ourselves, our
 heirs, executors, administrators, successors and assigns.

(5) Signed this _____ day of _____ 20____.

The condition of the above obligation is such that whereas, the above named principal did on the
(6) _____ day of _____, 20____, enter into a contract with the Township
 of Piscataway, 455 Hoes Lane, Piscataway, New Jersey 08854 for
(7) _____

which said contract is made a part of this the bond the same as though set forth herein;

Now, if the said **(8)** _____ shall well and faithfully do and perform the
 things agreed by **(9)** _____ to be done and performed according to the
 terms of said contract, and shall pay all lawful claims of beneficiaries as defined by N.J.S. 2A:44-143 for
 labor performed or materials, provisions, provender or other supplies or teams, fuels, oils, implements or
 machinery furnished, used or consumed in the carrying forward, performing or completing of said contract,
 we agreeing and assenting that this undertaking shall be for the benefit of any beneficiary as defined in N.J.S.
 2A: 44-143 having a just claim, as well as for the oblige herein; then this obligation shall be void; otherwise
 the same shall remain in full force and effect; it being expressly understood and agreed that the liability of
 the surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as
 herein stated.

The said surety hereby stipulates and agrees that no modifications, omissions or additions in or to the
 terms of the said contract or in or to the plans or specifications therefore shall in anywise affect the
 obligation of said surety on its bond.

Recovery of any claimant under the bond shall be subject to the conditions and provisions of this article
 to the same extent as if such conditions and provisions were fully incorporated in the form set forth above.

SAMPLE

Performance Payment Bond

This bond shall not be subject to cancellation either by the principal or by the surety for any reason until such time as all improvements subject to the bond have been accepted by the municipality.

This bond shall be deemed continuous in form and shall remain in full force and effect until the improvements are accepted by the municipality and the bond is released, or until default is declared, or until the bond is replaced by another bond meeting applicable legal requirements. Upon approval or acceptance of all improvements by the municipality, or upon replacement of this bond by another bond, liability under this bond shall cease.

The aggregate liability of the surety shall not exceed the sum set forth above.

In the event that the improvements subject to this bond are not completed within the time allowed under the contract or bid documents (hereinafter the "Contract") between principal and municipality, the municipal governing body may, at its option, and upon at least 30 days prior written notice to the principal and to the surety by personal delivery or by certified or registered mail or courier, declare the principal to be in default and, in the event that the surety fails or refuses to complete the work in accordance with the terms and conditions of said Contract, claim payment under this bond for the cost of completion of the work. In the event that any action is brought against the principal under this bond, written notice of such action shall be given to the surety by the municipality by personal delivery or by registered or certified mail or courier at the same time.

The surety shall have the right to complete the work in accordance with the terms and conditions of said Contract, either with its own employees or in conjunction with the principal or another contractor; provided, however, that the surety in its sole discretion, may make a monetary settlement with the municipality as an alternative to completing the work.

This bond shall insure to the benefit of the municipality only and no other party shall acquire any rights hereunder.

In the event that this bond shall for any reason cease to be effective prior to the approval or acceptance of all improvements, a cease and desist order may be issued by the governing body, in which case all work shall stop until such time as a replacement guarantee acceptable to municipality becomes effective.

SAMPLE

Performance Payment Bond

IN WITNESS WHEREOF , this instrument is executed in two (2) counterparts each of which shall be deemed an original , this the **(10)** _____ day of _____ , 20

Attest :

Principal

(Typed or Printed)

Principal Secretary

(Typed or Printed)

By: _____ (s)

Address

SEAL :

Witness to Princip

SAMPLE

Attest :

Surety
By: _____ (s)
Attorney-in-fact

Surety Secretary

SEAL :

Address

Witness as to Surety

Address

SAMPLE

CONTRACTOR INSURANCE REQUIREMENTS

Contractors

When the municipality lets work to a contractor, it is expected and required the contractor provide the municipality with the following minimum amount of insurance.

a) Small Service and Repair Contractors

- General Liability, including Products/Completed
- Operations – Limit \$500,000 CSL
- Authority to be named as additional insured
- Auto Liability: Limit \$500,000 CSL
- Coverage to include “Non-Owned and Hired Automobiles”
- Workers’ Compensation Insurance – statutory limits

b) Larger Contractors (Includes contractors that are doing new construction or major alterations):

Requirements are same as above with exception of limits which are to be \$ 1 Million CSL for both General and Automobile Liability.

Note: No work shall be allowed to begin without property Insurance Certificates on file with the member municipality and approved by the Insurance producer. Also, refer back to Item #9 in the underwriting section of the Policies and Procedures Manual for Insurance requirements for pyrotechnic contractors.

ADDITIONAL INSURED

The Township of Piscataway must be named additional Insured.
The description of the Goods & Services must be listed.

SAMPLE CERTIFICATE OF INSURANCE



CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

| | | |
|--|---|--------|
| PRODUCER Applicants Insurance Company Name and Address | THIS CERTIFICATION IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. | |
| | INSURERS AFFORDING COVERAGE | NAIC # |
| INSURED Applicants Company Name and Address | INSURER A: | |
| | INSURER B: | |
| | INSURER C: | |
| | INSURER D: | |
| | INSURER E: | |

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIODS INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

| INSURANCE TYPE (ACORD LTR #) | TYPE OF INSURANCE | POLICY NUMBER | POLICY EFFECTIVE DATE (MM/DD/YYYY) | POLICY EXPIRATION DATE (MM/DD/YYYY) | LIMITS |
|------------------------------|---|--------------------------------|------------------------------------|-------------------------------------|--|
| 1 | GENERAL LIABILITY <input type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS MADE <input type="checkbox"/> OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input type="checkbox"/> PERIOD <input type="checkbox"/> LOC | Policy Number | | Term | EACH OCCURRENCE \$ \$1,000,000 DAMAGE TO RENTED PREMISES (EA OCCUR) \$ MED EXP (Any one person) \$ PERSONAL & ADV INJURY \$ GENERAL AGGREGATE \$ PRODUCTS - COMP/OP AGG \$ |
| | AUTOMOBILE LIABILITY <input type="checkbox"/> ANY AUTO <input type="checkbox"/> ALL OWNED AUTOS <input type="checkbox"/> SCHEDULED AUTOS <input type="checkbox"/> HIRED AUTOS <input type="checkbox"/> NON-OWNED AUTOS | Policy Number | | Term | CORRECTED SINGLE LIMIT (EA OCCUR) \$ \$1,000,000 BODILY INJURY (EA OCCUR) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$ AUTO ONLY - EA ACCIDENT \$ OTHER THAN AUTO ONLY: EA ACC \$ AGG \$ |
| 2 | EXCESS/UMBRELLA LIABILITY <input type="checkbox"/> OCCUR <input type="checkbox"/> CLAIMS MADE DEDUCTIBLE RETENTION \$ | Policy Number | | Term | EACH OCCURRENCE \$ \$2,000,000 AGGREGATE \$ \$ \$ |
| 3 | WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETORS/PARTNERS/EXECUTIVE OFFICERS/EMBER EXCLUDED? If yes, describe below SPECIAL PROVISIONS below OTHER | Policy Number If applicable | | Term | WC STATUS: <input type="checkbox"/> TOY LIMITS <input type="checkbox"/> OTHER E.L. EACH ACCIDENT \$ \$100,000 E.L. DISEASE - EA EMPLOYEE \$ \$100,000 E.L. DISEASE - POLICY LIMIT \$ \$500,000 |

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS

Leave Blank **NAME OF PROJECT AND LOCATION**

| | |
|---|---|
| CERTIFICATE HOLDER ATTN: TOWSHIP OF PISCATAWAY 455 HOES LANE PISCATAWAY, NJ 08854 | CANCELLATION SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL _____ DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES. AUTHORIZED REPRESENTATIVE |
|---|---|

SAMPLE

TAXPAYER IDENTIFICATION

Form **W-9**
(Rev. November 2017)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

Give Form to the
requester. Do not
send to the IRS.

Go to www.irs.gov/FormW9 for instructions and the latest information.

| | | |
|--|---|---|
| Print or type. See Specific Instructions on page 3. | 1 Name (as shown on your income tax return). Name is required on this line; do not leave this line blank. | |
| | 2 Business name/disregarded entity name, if different from above | |
| | 3 Check appropriate box for federal tax classification of the person whose name is entered on line 1. Check only one of the following seven boxes. | 4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3): |
| | <input type="checkbox"/> Individual/sole proprietor or single-member LLC <input type="checkbox"/> Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=Partnership) ▶ _____ Note: Check the appropriate box in the line above for the tax classification of the single-member owner. Do not check LLC if the LLC is classified as a single-member LLC that is disregarded from the owner unless the owner of the LLC is another LLC that is not disregarded from the owner for U.S. federal tax purposes. Otherwise, a single-member LLC that is disregarded from the owner should check the appropriate box for the tax classification of its owner. <input type="checkbox"/> Other (see instructions) ▶ _____ | <input type="checkbox"/> C Corporation <input type="checkbox"/> S Corporation <input type="checkbox"/> Partnership <input type="checkbox"/> Trust/estate Exempt payee code (if any) _____ Exemption from FATCA reporting code (if any) _____ <i>(Applies to accounts maintained outside the U.S.)</i> |
| | 5 Address (number, street, and apt. or suite no.) See instructions. | Requester's name and address (optional) |
| | 6 City, state, and ZIP code | |
| | 7 List account number(s) here (optional) | |

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1, and you must have backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the instructions for Part I, later. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN*, later.

Note: If the account is in more than one name, see the instructions for line 1, *So Sign What Name and Number To Give the Requester* for guidelines on whose number to enter.

| |
|---|
| Social Security number |
| <input type="text"/> <input type="text"/> <input type="text"/> - <input type="text"/> <input type="text"/> <input type="text"/> |
| OR |
| Employer identification number |
| <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> - <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> |

Part II Certification

Under penalties of perjury, I certify that:

- The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
- I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
- I am a U.S. citizen or other U.S. person (defined below); and
- The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions for Part II, later.

| | | |
|------------------|----------------------------|--------|
| Sign Here | Signature of U.S. person ▶ | Date ▶ |
|------------------|----------------------------|--------|

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. For the latest information about developments related to Form W-9 and its instructions, such as legislation enacted after they were published, go to www.irs.gov/FormW9.

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following.

- Form 1099-INT (interest earned or paid)
- Form 1099-DIV (dividends, including those from stocks or mutual funds)
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
- Form 1099-S (proceeds from real estate transactions)
- Form 1099-K (merchant card and third party network transactions)
- Form 1098 (home mortgage interest), 1098-E (student loan interest), 1098-T (tuition)
- Form 1099-C (canceled debt)
- Form 1099-A (acquisition or abandonment of secured property)

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

If you do not return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See What is backup withholding, later.

SAMPLE

SALES TAX

CONTRACTOR'S NEW JERSEY
TAX REGISTRATION NUMBER

To be completed by contractor
and retained by seller.

FORM ST-13

CONTRACTOR'S EXEMPT PURCHASE CERTIFICATE

TO: _____ (Name of Seller) _____ (Date)

(Address of Seller)

The materials, supplies, or services purchased by the undersigned are for exclusive use in erecting structures, or building on, or otherwise improving, altering or repairing real property of the exempt organization, governmental entity, or qualified housing sponsor named below and are exempt from Sales and Use Tax under N.J.S.A. 54:32B-8.22.

THIS CONTRACT COVERS WORK TO BE PERFORMED FOR: (Check one)

EXEMPT ORGANIZATION

Name of Exempt Organization _____

Address _____

Exempt Organization Number _____

NEW JERSEY OR FEDERAL GOVERNMENTAL ENTITY

Name of Governmental Entity _____

Address of Governmental Entity _____

QUALIFIED HOUSING SPONSOR

Name of Qualified Housing Sponsor _____

Address of Qualified Housing Sponsor _____

ADDRESS OR LOCATION OF CONTRACT WORK SITE: (property must be owned or leased by one of the above)

I, the undersigned contractor, hereby verify and affirm that all of the information shown on this certificate is true.

SAMPLE

Name of Contractor as registered with the New Jersey Division of Taxation

Address of Contractor

Signature of Contractor or Authorized Employee

See INSTRUCTIONS on reverse side.

INSTRUCTIONS TO SELLERS CONCERNING
CONTRACTOR'S EXEMPT PURCHASE CERTIFICATES - ST-13

- 1. Good Faith-** To act in good faith means to act in accordance with standards of honesty. In general, registered sellers who accept exemption certificates in good faith are relieved of liability for the collection and payment of sales tax on the transactions covered by the exemption certificate.

In order for good faith to be established, the following conditions must be met:

- (a) Certificate must contain no statement or entry which the seller knows is false or misleading;
- (b) Certificate must be an official form or a proper and substantive reproduction, including electronic;
- (c) Certificate must be filled out completely;
- (d) Certificate must be dated and include the purchaser's New Jersey tax identification number or, for a purchaser that is not registered in New Jersey, the Federal employer identification number or out-of-State registration number. Individual purchasers must include their driver's license number; and
- (e) Certificate or required data must be provided within 90 days of the sale.

The seller may, therefore, accept this certificate in good faith as a basis for exempting sales to the signatory purchaser and is relieved of liability even if it is determined that the purchaser improperly claimed the exemption.

- 2. Improper Certificate** - Sales transactions which are not supported by properly executed exemption certificates are deemed to be taxable retail sales. In this situation, the burden of proof that the tax was not required to be collected is upon the seller.
- 3. Correction of Certificate** - In general, sellers have 90 days after the date of sale to obtain a corrected certificate where the original certificate lacked material information required to be set forth in said certificate or where such information is incorrectly stated.
- 4. Additional Purchases by Same Purchaser** - This Certificate will serve to cover additional purchases by the same purchaser of the same general type of property or service. However, each subsequent sales slip or purchase invoice based on this Certificate must show the purchaser's name, address and Certificate of Authority Number for purpose of verification.
- 5. Retention of Certificates** - Certificates must be retained by the seller for a period of not less than four years from the date of the last sale covered by the certificate. Certificates must be in the physical possession of the seller and available for inspection on or before the 90th day following the date of the transaction to which the certificate relates.

6. Definitions:

"Contractor" - means any individual, partnership, corporation or other commercial entity engaged in any business involving erecting structures for others, or building on, or otherwise improving, altering, or repairing real property of others.

"Exempt Organization" - is any organization which holds a valid exempt organization permit issued pursuant to the provisions of N.J.S.A. 54:32B-9(b) which has issued an ST-5 Exempt Organization Certificate to the contractor.

"New Jersey or Federal Governmental Entity" - is any agency, instrumentality, political subdivision, authority, or public corporation of the governments of the United States of America or the State of New Jersey. Governmental agencies, instrumentalities or political subdivisions of states other than New Jersey do not qualify for exemption.

"Qualified Housing Sponsor" - is any person, partnership, corporation or association certified by the New Jersey Housing and Mortgage Finance Agency to have obtained financing, in addition to federal, state or local government subsidies, for a housing project from the New Jersey Housing and Mortgage Finance Agency pursuant to N.J.S.A. 55:14K-1, et seq. and has issued a New Jersey Sales and Use Tax Housing Sponsor Letter of Exemption to the contractor.

PRIVATE REPRODUCTION of Contractor's Exempt Purchase Certificates may be made without the prior permission of the Division of Taxation.

FOR MORE INFORMATION:

Call the Customer Service Center (609) 292-6400. Send an e-mail to nj.taxation@treas.state.nj.us. Write to: New Jersey Division of Taxation, Information and Publications Branch, PO Box 281, Trenton, NJ 08695-0281.

STATE OF NEW JERSEY

DEPARTMENT OF LABOR & WORKFORCE DEVELOPMENT
CONSTRUCTION EEO COMPLIANCE MONITORING PROGRAM

FORM AA-201
Revised 11/11

INITIAL PROJECT WORKFORCE REPORT CONSTRUCTION

Official Use Only

Assignment _____

Code _____

For instructions on completing the form, go to: http://www.state.nj.us/treasury/contract_compliance/pdf/aa201ins.pdf

| | | |
|--|---|--|
| 1. FID NUMBER _____ | 2. CONTRACTOR ID NUMBER _____ | 5. NAME AND ADDRESS OF PUBLIC AGENCY AWARDING CONTRACT Name: _____ Address: _____ CONTRACT NUMBER _____ DATE OF AWARD _____ DOLLAR AMOUNT OF AWARD _____ |
| 3. NAME AND ADDRESS OF PRIME CONTRACTOR _____ (Name) _____ (Street Address) _____ (City) (State) (Zip Code) | | 6. NAME AND ADDRESS OF PROJECT Name: _____ Address: _____ |
| 4. IS THIS COMPANY MINORITY OWNED <input type="checkbox"/> OR WOMAN OWNED <input type="checkbox"/> | | 7. PROJECT NUMBER _____ |
| 9. TRADE OR CRAFT | | 8. IS THIS PROJECT COVERED BY A PROJECT LABOR AGREEMENT (PLA)? YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> |

| 9. TRADE OR CRAFT | PROJECTED TOTAL EMPLOYEES | | | | PROJECTED MINORITY EMPLOYEES | | | | PROJECTED PHASE - IN DATE | PROJECTED COMPLETION DATE |
|------------------------|---------------------------|----|--------|----|------------------------------|----|--------|----|---------------------------|---------------------------|
| | MALE | | FEMALE | | MALE | | FEMALE | | | |
| | J | AP | J | AP | J | AP | J | AP | | |
| 1. ASBESTOS WORKER | | | | | | | | | | |
| 2. BRICKLAYER OR MASON | | | | | | | | | | |
| 3. CARPENTER | | | | | | | | | | |
| 4. ELECTRICIAN | | | | | | | | | | |
| 5. GLAZIER | | | | | | | | | | |
| 6. HVAC MECHANIC | | | | | | | | | | |
| 7. IRONWORKER | | | | | | | | | | |
| 8. OPERATING ENGINEER | | | | | | | | | | |
| 9. PAINTER | | | | | | | | | | |
| 10. PLUMBER | | | | | | | | | | |
| 11. ROOFER | | | | | | | | | | |
| 12. SHEET METAL WORKER | | | | | | | | | | |
| 13. SPRINKLER FITTER | | | | | | | | | | |
| 14. STEAMFITTER | | | | | | | | | | |
| 15. SURVEYOR | | | | | | | | | | |
| 16. TILER | | | | | | | | | | |
| 17. TRUCK DRIVER | | | | | | | | | | |
| 18. LABORER | | | | | | | | | | |
| 19. OTHER | | | | | | | | | | |
| 20. OTHER | | | | | | | | | | |

I hereby certify that the foregoing statements made by me are true. I am aware that if any of the foregoing statements are willfully false, I am subject to punishment.

(Signature)

10. _____ (Please Print Your Name) _____ (Title)

(Area Code) (Telephone Number) (Ext.) _____ (Date)

INSTRUCTIONS FOR COMPLETING THE INITIAL PROJECT

WORKFORCE REPORT – CONSTRUCTION (AA201)

DO NOT COMPLETE THIS FORM FOR GOODS AND/OR SERVICE CONTRACTS

1. Enter the Federal Identification Number assigned to the contractor by the Internal Revenue Service, or if a Federal Employer Identification Number has been applied for but not yet issued, or if your business is such that you have not or will not receive a Federal Identification Number, enter the social security number assigned to the single owner or one partner, in the case of a partnership.
2. Note: The Department of Labor & Workforce Development, Construction EEO Monitoring Program will assign a contractor ID number to your company. This number will be your permanently assigned contractor ID number that must be on all correspondence and reports submitted to this office.
3. Enter the prime contractor's name, address and zip code number.
4. Check box if Company is Minority Owned or Woman Owned
5. Enter the complete name and address of the Public Agency awarding the contract. Include the contract number, date of award and dollar amount of the contract.
6. Enter the name and address of the project, including the county in which the project is located.
7. Note: A project contract ID number will be assigned to your firm upon receipt of the completed Initial Project Workforce Report (AA201) for this contract. This number must be indicated on all correspondence and reports submitted to this office relating to this contract.
 8. Check "Yes" or "No" to indicate whether a Project Labor Agreement (PLA) was established with the labor organization(s) for this project.
9. Under the Projected Total Number of Employees in each trade or craft and at each level of classification, enter the total composite workforce of the prime contractor and all subcontractors projected to work on the project. Under Projected Employees enter total minority and female employees of the prime contractor and all subcontractors projected to work on the project. Minority employees include Black, Hispanic, American Indian and Asian, (J=Journey worker, AP=Apprentice). Include projected phase-in and completion dates.
10. Print or type the name of the company official or authorized Equal Employment Opportunity (EEO) official include signature and title, phone number and date the report is submitted.

This report must be submitted to the Public Agency that awards the contract and the Department of Labor & Workforce Development, Construction EEO Compliance Monitoring Program after notification of award, but prior to signing the contract.

THE CONTRACTOR IS TO RETAIN A COPY AND SUBMIT COPY TO THE PUBLIC AGENCY AWARDING THE CONTRACT AND FORWARD A COPY TO:

**NEW JERSEY DEPARTMENT OF LABOR & WORKFORCE DEVELOPMENT
CONSTRUCTION EEO COMPLIANCE MONITORING UNIT**

**P.O. BOX 209
TRENTON, NJ 08625-0209
(609) 292-9550**

PAYROLL

(For Contractor's Optional Use; See Instructions at www.dol.gov/whd/forms/wh347instr.htm)



Rev. Dec. 2008

Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number.

NAME OF CONTRACTOR OR SUBCONTRACTOR ADDRESS OMB No.: 1235-0008
Expires: 01/31/2015

PAYROLL NO. FOR WEEK ENDING PROJECT AND LOCATION PROJECT OR CONTRACT NO.

| (1) NAME AND INDIVIDUAL IDENTIFYING NUMBER (e.g., LAST FOUR DIGITS OF SOCIAL SECURITY NUMBER) OF WORKER | (2) NO. OF WITHHOLDING EXEMPTIONS | (3) WORK CLASSIFICATION | (4) DAY AND DATE OT OR ST. HOURS WORKED EACH DAY | (5) TOTAL HOURS | (6) RATE OF PAY | (7) GROSS AMOUNT EARNED | (8) DEDUCTIONS | | | | | (9) NET WAGES PAID FOR WEEK |
|--|--|-------------------------------|--|-----------------------|-----------------------|----------------------------------|-------------------|-------------------------|--|-------|---------------------|---|
| | | | | | | | FICA | WITH- HOLDING TAX | | OTHER | TOTAL DEDUCTIONS | |
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SAMPLE

While completion of Form WH-347 is optional, it is mandatory for covered contractors and subcontractors performing work on Federally financed or assisted construction contracts to respond to the information collection contained in 29 C.F.R. §§ 3.3, 5.5(a). The Copeland Act (40 U.S.C. § 3145) contractors and subcontractors performing work on Federally financed or assisted construction contracts to "furnish weekly a statement with respect to the wages paid each employee during the preceding week." U.S. Department of Labor (DOL) regulations at 29 C.F.R. § 5.5(a)(3)(ii) require contractors to submit weekly a copy of all payrolls to the Federal agency contracting for or financing the construction project, accompanied by a signed "Statement of Compliance" indicating that the payrolls are correct and complete and that each laborer or mechanic has been paid not less than the proper Davis-Bacon prevailing wage rate for the work performed. DOL and federal contracting agencies receiving this information review the information to determine that employees have received legally required wages and fringe benefits.

Public Burden Statement

We estimate that it will take an average of 55 minutes to complete this collection, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. If you have any comments regarding these estimates or any other aspect of this collection, including suggestions for reducing this burden, send them to the Administrator, Wage and Hour Division, U.S. Department of Labor, Room S3502, 200 Constitution Avenue, N.W. Washington, D.C. 20210

SAMPLE

INSTRUCTIONS FOR COMPLETING MONTHLY PROJECT WORKFORCE REPORT- (AA202)

1. Enter the prime contractor's name, address and zip code number.
2. Enter the **CONTRACTOR ID NUMBER** assigned by the Dept. of Labor & Workforce Development Construction EEO Compliance Monitoring Program.
3. Enter the Federal Identification Number assigned to the contractor by the Internal Revenue Service, or if a Federal Employer Identification Number has not been applied for or issued, or if your business is such that it will not receive a Federal Identification Number, enter the Social Security Number of the owner or of one partner, in the case of a partnership.
4. Reporting Period - enter the beginning and ending dates of the month for the report being submitted. (i.e., 1/1/00 – 1/31/00).
5. Enter the complete name of the public agency awarding the contract. Include the date of contract award.
6. Enter the name and location of the project, including the county in which the project is located.
7. Enter the **PROJECT NUMBER** assigned by the Dept. of Labor & Workforce Development Construction EEO Compliance Monitoring Program.
8. Enter the company name(s) of the contractor(s) performing work at the construction site. List the prime contractor first with subcontractor(s) following.
9. Enter the total percent (%) of project work the contractor or subcontractor has completed, to date.
10. Identify the trades or crafts applicable to the prime contractor and each subcontractor listed in column #8. Use a single line for each trade or craft.
11. Enter the total number of employees for each contractor at each level of classification (J=Journeyworker, AP=Apprentice) and the total number of each minority group - Black, Hispanic, American Indian, Asian and Female. Note: Column A shall include Total Number of employees. Columns B-E shall also include minority females. Column F shall include both non-minority and minority females.
12. Enter the total number of minority employees for each employer at each level of classification. Note: This shall be the sum of columns B-E.
13. Enter the Total Monthly work hours for all employees in each craft at each level of classification.
(A) Enter the Total Monthly minority work hours for each craft at each level of classification (Columns B-E).
(B) Enter the Total Monthly female work hours for each craft at each level of classification (Column F).
14. (A) Enter the Total Monthly PERCENT of minority work hours for each craft at each level of classification.
(B) Enter the Total Monthly PERCENT of female work hours for each craft at each level of classification.
15. Enter the Total Cumulative work hours for each craft at each level of classification.
(A) Enter the Total Cumulative minority work hours for each craft at each level of classification.
(B) Enter the Total Cumulative female work hours for each craft at each level of classification.
16. (A) Enter the Cumulative Percent of minority work hours for each craft at each level of classification.
(B) Enter the Cumulative Percent of female work hours for each craft at each level of classification.
17. Print or type the name of the company official submitting the report; include signature, title, telephone number, and date the report is submitted.

THE CONTACTOR SHOULD RETAIN ONE COPY AND SUBMIT A COPY TO THE PUBLIC AGENCY WHICH AWARDED THE CONTRACT. ANOTHER COPY MUST BE FORWARDED TO:

New Jersey Department of Labor & Workforce Development
Construction EEO Compliance Monitoring Program
PO Box 209
Trenton, NJ 08625-0209
609 292-9550

State Of New Jersey

Department of Labor & Workforce Development
Construction EEO Compliance Monitoring Program

MONTHLY PROJECT WORKFORCE REPORT - CONSTRUCTION

| | | | | |
|--|--|---|---------------------|--|
| For instructions on completing the form, go to: http://www.state.nj.us/treasury/contract_compliance/pdf/aa202ins.pdf | | 3. F ID or SS Number | | |
| 1. Name and address of Prime Contractor (NAME) | | 2. Contractor ID Number | 4. Reporting Period | |
| (ADDRESS) | | 5. Public Agency Awarding Contract Date of Award | | |
| (CITY) (STATE) (ZIP CODE) | | 6. Name and Location of Project County | | |
| | | 7. Project ID Number | | |

| 8. CONTRACTOR NAME (LIST PRIME CONTRACTOR WITH SUBS FOLLOWING) | 9. PERCENT OF WORK COMPLETED | 10. TRADE OR CRAFT | CLASSIFICATION (SEE REVERSE) | 11. NUMBER OF EMPLOYEES | | | | | | 12. TOTAL | 13. WORK HOURS | | 14. % OF WORK HRS | | 15. CUM. WORK HRS | | | 16. CUM. % OF W/H | | |
|---|------------------------------|--------------------|------------------------------|-------------------------|-------|----------|-----------------|-------|---------|------------------|------------------|----------|-------------------|---------------|-------------------|------------------|------------|-------------------|---------------|---------------|
| | | | | A. | B. | C. | D. | E. | F. | NO. OF MIN. EMP. | TOTAL WORK HOURS | A. | B. | A. | B. | TOTAL WORK HOURS | A. | B. | A. | B. |
| | | | | TOTAL | BLACK | HISPANIC | AMERICAN INDIAN | ASIAN | FEMALES | | | MIN. W/H | FEMALE W/H | % OF MIN. W/H | % OF FEMALE W/H | | MIN. HOURS | FEMALE HOURS | % OF MIN. W/H | % OF FEM. W/H |
| | | | J | | | | | | | | | | | | | | | | | |
| | | | AP | | | | | | | | | | | | | | | | | |
| | | | J | | | | | | | | | | | | | | | | | |
| | | | AP | | | | | | | | | | | | | | | | | |
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| | | | J | | | | | | | | | | | | | | | | | |
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SAMPLE

17. COMPLETED BY (PRINT OR TYPE)

| | | |
|--------|-------------|---------|
| | | |
| (NAME) | (SIGNATURE) | (TITLE) |

| | | | |
|-------------|--------------------|--------|--------|
| | | | |
| (AREA CODE) | (TELEPHONE NUMBER) | (EXT.) | (DATE) |

THE TOWNSHIP OF PISCATAWAY



LAST PAGE