GREATER DAYTON PREMIER MANAGEMENT

GDPM - REVERE

INVITATION FOR BIDS

Greater Dayton Premier Management is seeking bids from qualified contractors to furnish all labor, materials, and equipment for the following project(s):

<table>
<thead>
<tr>
<th>Issue Date</th>
<th>Friday, December 13, 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solicitation Number</td>
<td></td>
</tr>
<tr>
<td>Pre-Bid Meeting</td>
<td>Thursday, January 9, 2020, 9:30 am</td>
</tr>
<tr>
<td>Request for Interpretations Deadline</td>
<td>Tuesday, January 14, 2020</td>
</tr>
<tr>
<td>Bid Due Date</td>
<td>Thursday, January 30, 2020</td>
</tr>
</tbody>
</table>

The Pre-Bid Meeting shall be held at the Greater Dayton Premier Management 400 Wayne Avenue, Dayton, Ohio.

Bids shall be received at Greater Dayton Premier Management 400 Wayne Avenue, Dayton, Ohio.

Any Requests for Interpretations must be submitted to the Architect in writing by the deadline given.

Architect: Berardi + Partners Inc.
Attn: Joe Berardi
1398 Goodale Blvd.
Columbus OH 43212
614-221-1110

Questions relating to “Section 3” compliance shall be directed to GDPM.

The bid documents are available at the following web address: https://mrcrepro.com/repro or call MRC Repro at (937) 428-7831 and ask for Nicci Jett.

Greater Dayton Premier Management reserves the right to reject any or all bids, or to waive any informality in the bidding. No bids shall be withdrawn for a period of ninety (90) days subsequent to the opening of the bids.

All bidders shall be required to meet the Affirmative Action requirements and Equal Employment Opportunity requirements. Each bidder must insure that all employees and applicants for employment are not discriminated against because of their race, color, religion, sex, national origin, disability, handicap, age, ancestry, creed, or military status.
Dayton Metropolitan Housing Authority dba
Greater Dayton Premier Management (GDPM)
400 Wayne Avenue, Dayton, Ohio 45410

BIDDER'S PACKET

IFB # 19-02 DMHA Revere
Dayton, OH 45410

PRE-BID DATE / TIME:
Thursday, January 9, 2020 at 9:30
AM

BID OPENING DATE / TIME:
Thursday, January 30, 2020 at 10:00 AM

LOCATION:
400 Wayne Ave Dayton, Ohio 45410

Time Table:

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friday, December 13, 2020</td>
<td>Date IFB Issued</td>
</tr>
<tr>
<td>Thursday, January 9, 2020</td>
<td>Pre-Bid Conference @ 400 Wayne Ave @ 9:30AM</td>
</tr>
<tr>
<td>Thursday, January 9, 2020</td>
<td>Revere Site Visit following Pre-Bid Meeting</td>
</tr>
<tr>
<td>Tuesday, January 14, 2020</td>
<td>Deadline for written questions from contractors</td>
</tr>
<tr>
<td>Friday, January 17, 2020</td>
<td>Deadline for responses to written questions from contractors, addendums and/or clarifications to contractors</td>
</tr>
<tr>
<td>Thursday, January 30, 2020</td>
<td>Public Bid opening @ 400 Wayne Ave @ 10:00 AM</td>
</tr>
</tbody>
</table>
INSTRUCTIONS

PLEASE READ THOROUGHLY

Visit: http://www.gdpm.org/doing-business-with-gdpm/invitation-bids.html to check for Clarifications, Addendums, Response to Inquiries, Companies that Attended Pre-Bid, and Bid Results.

All bids packets must be delivered in a Sealed Envelope. All bid packets must be received on or before the date and time of the Bid Opening. If mailing a bid packet, ensure bid will arrive on time at the address below. Bid packets received late will not be accepted.

Mail bid packet to: Greater Dayton Premier Management
                      400 Wayne Avenue,
                      Dayton, Ohio 45410
                      Attn: Procurement Department/IFB # 19-02

The next page lists all of the forms that MUST be presented to submit a complete bid packet.

The entire IFB and Bid Form are available through Berardi Partners at the contact information provided below.

All bid packets must have exhibits in the order listed on the following page. The bidder must submit one (1) completed original bid packet that includes all of the exhibits. Bid packets do not need to be formally bound, but it is requested that documents be clipped together.

Please read bid documents carefully. If a company has questions, it is advised that a representative attend the Pre-Bid Conference and/or submit questions to procurement@gdpm.org by the deadline for submitting questions.

Questions regarding exhibits and the submission of bids may be directed to: GDPM’s PROCUREMENT DEPARTMENT
Contact: Xavier Gullatte
Phone: 937-910-7500
E-mail: procurement@gdpm.org.

Questions about the bid scope, specifications and requirements may be directed to:
BERARDI+COLUMBUS
Contact: JOE BERARDI, LEED AP BD+C and Homes
1398 Goodale Blvd.
Columbus, Ohio 43212
Phone 614.221.1110
Cell 614.832.7141
E-mail: jberardi@berardipartners.com
**Greater Dayton premier Management**

Table of Contents For  
IFB # 19-02 DMHA Revere  Dayton, OH 45410

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**EXHIBITS**

The below Exhibits must be included with the Sealed Bid IFB submission. *It is advised that the exhibits are submitted in the order and labeled according to the list below.*

<table>
<thead>
<tr>
<th>Exhibit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bid Guaranty &amp; Bond Form</td>
</tr>
<tr>
<td>2</td>
<td>Bid Form</td>
</tr>
<tr>
<td>3</td>
<td>Solicitation Acknowledgement, Contractor Responsibility, Offer Form</td>
</tr>
<tr>
<td>4</td>
<td>Non–Collusive Affidavit and Full Disclosure Statement (Must be notarized)</td>
</tr>
<tr>
<td>5</td>
<td>Statement of Bidder’s Qualifications (You may use your own paper and format, so long as you follow the numbering as given…the form must be notarized)</td>
</tr>
<tr>
<td>6</td>
<td>Certification as to Corporate Principal (Must be notarized)</td>
</tr>
<tr>
<td>7</td>
<td>Reference Release Forms (5) (Do not list GDPM staff or board members a reference.)</td>
</tr>
</tbody>
</table>

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**ATTACHMENTS**

Attachments are for review/acknowledgement purposes and should not be included in the submission.

*Attachment ******* General Terms & Conditions (For review only) (please note: This project is not subject to prevailing wage. Any reference to Davis Bacon Wages or Prevailing Wages and/or any contractor obligations therein are inapplicable to this project.)*

*Attachment ******* Section 3 Supplemental Instructions (For review only)*

*Attachment ******* Decline to Bid Form (Only if you are not submitting a bid)*

*Attachment ******* Legal Ad (For review only)*
Greater Dayton Premier Management

Bid Guaranty and Bond

(Ohio revised Code Section 153.571)

KNOW ALL PERSONS BY THESE PRESENTS, that we, the undersigned ____________________________

_____________________________________________________________

as PRINCIPAL, and ____________________________

_____________________________________________________________

as SURETIES, are hereby held and firmly bound unto The Dayton Metropolitan Housing Authority d/b/a Greater Dayton Premier Management (GDPM), as Obligee, in the penal sum of the dollar amount of the bid submitted by the Principal to GDPM on the ___ day of ____________, 20__ to undertake the Project known as:

PROJECT NAME: _____________________________________________

Solicitation No.: _____________________________________________

The penal sum referred to herein shall be the dollar amount of the Principal's bid to GDPM, incorporating any additive or deductive alternate bids made by the Principal on the date referred to above to GDPM, which are accepted by GDPM. In no case shall the penal sum exceed the amount of ______________________ dollars. (If the foregoing blank is not filled in, the penal sum will be the full amount of the Principal's bid, including alternates. Alternatively, if the blank is filled in, the amount stated must not be less than the full amount of the bid including alternates, in dollars and cents. A percentage is not acceptable.) For the payment of the penal sum well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

SIGNED this ______ day of ____________________________, 20__.

THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that whereas the above-named Principal has submitted a bid for the above referenced Project.
NOW, THEREFORE, if GDPM accepts the bid of the Principal and the Principal fails to enter into a proper contract in accordance with the bid, plans, details, specifications, bills of material and all other solicitation documents; and in the event the Principal pays GDPM the difference not to exceed ten per cent of the penalty hereof between the amount specified in the bid and such larger amount for which GDPM may in good faith contract with the next lowest bidder to perform the work covered by the bid; or in the event GDPM does not award the contract to the next lowest bidder and resubmits the Project for bidding, the Principal pays to GDPM the difference not to exceed ten per cent of the penalty hereof between the amount specified in the bid, or the costs, in connection with the resubmission, of printing new contract documents, required advertising, and printing and mailing notices to prospective bidders, whichever is less, then this obligation shall be null and void, otherwise to remain in full force and effect; if GDPM accepts the bid of the Principal and the Principal within ten days after the awarding of the Contract enters into a proper Contract in accordance with the bid, plans, details, specifications, bills of material and all other solicitation documents which said Contract is made a part of this bond the same as though set forth herein;

AND FURTHER, if the said Principal shall well and faithfully do and perform the things agreed by GDPM to be done and performed according to the terms of said Contract; and shall pay all lawful claims of subcontractors, materials suppliers, and laborers, for labor performed and materials furnished in the carrying forward, performing, or completing of said Contract; we agreeing and assenting that this undertaking shall be for the benefit of any materials suppliers or laborer having a just claim, as well as for the obligee 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.

AND FURTHER, the Principal will correct or replace any defective work or materials discovered by GDPM within a period of one year from the date of acceptance of such work or material by GDPM, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

THE SAID Surety hereby stipulates and agrees that no modifications, omissions, or additions, in or to the terms of the said Contract or in the Plans and Specifications therefor shall in any wise affect the obligations of said Surety on its bond, and it does hereby waive notice of any such modifications, omissions, or additions, in or to the terms of the Contract, the Work or the Contract Documents, including, without limitation the Plans and Specifications.
PRINCIPAL:

______________________________
Principal Signature

By: __________________________

Title: __________________________

SURETY:

______________________________
Surety Signature

By: __________________________

Attorney-in-Fact

Surety Agent’s Information:

______________________________
Agency Name

______________________________
Street

______________________________
City State Zip

______________________________
Telephone No.

(Attach hereto the current Power of Attorney of the person executing this bond for the Surety.)
Bid Form

To: Greater Dayton Premier Management
400 Wayne Avenue
Dayton, Ohio 45410
Phone: 937.910.7500  Fax: 937.222.3554

Having carefully read and examined the "Scope of Work", "Specifications", "Plans", "GDPM General Terms and Conditions for Construction Services", and any addendum for:

RAD Rehabilitation
2531 Revere Rd.
Dayton, Ohio 45419

As prepared by:
Berardi+Partners, Inc.
1398 Goodale Blvd.
Columbus Oh 43212
614-221-1110
Joseph Berardi

The undersigned acknowledges and agrees to all covenants, terms, and conditions as set forth in the documents specified above, and having inspected the premises and all conditions affecting the work, the undersigned proposes to furnish all materials and perform all labor necessary for the performance and completion of the work indicated below, all in compliance with the documents named above. Further, by signing below and through submitting its bid, the undersigned acknowledges and that the undersigned has carefully reviewed and agrees to all covenants, terms, and conditions as set forth in the GDPM General Terms and Conditions for Construction Services contained herein and which terms are final, binding and shall not be subject to modification.

Submitted by: ___________________________________________
Contracting Firm

Having read and examined the Contract Documents, prepared by the Associate for the above-referenced Project, and the following Addenda:

<table>
<thead>
<tr>
<th>Addendum No.</th>
<th>Date of Receipt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bid Form

BF-1
Bid Bond or Certified Check is included as part of Contractor’s bid submittal: _____Yes _____No  
Bidder Initials ____________________

Affidavit of Intent to Store Materials is included as part of Contractor’s bid submittal: _____Yes _____No  
Bidders Initials ____________________

MBE Participation: GDPM has established goals of twenty-five (25%) Minority Business Enterprise Participation.

To achieve this goal, contractors are encouraged to engage in joint ventures with MBE’s to include MBE’s as subcontractors, and utilize other initiatives that enhance opportunities for MBE’s.

Should the contractor be unable to achieve this goal, supporting documentation and notarized affidavits, indicating MBE’s date of notification, MBE’s date of response, nature of response or no response. Provide conclusion as to why the bid submitted does not meet MBE requirements.

The bid submittal includes a minimum of 25% MBE Participation: _____Yes _____No  
Bidder’s Initials ____________________

1. BASE BID:

A. BASE BID – Rehabilitation at 2531 Revere Road: Divisions 1-32, all work inclusive

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labor</td>
<td>$__________________________</td>
</tr>
<tr>
<td>Material</td>
<td>$__________________________</td>
</tr>
<tr>
<td>Total Bid 2531 Revere</td>
<td>$__________________________</td>
</tr>
<tr>
<td>Unforseen Conditions Allowance</td>
<td>$47,269.00</td>
</tr>
<tr>
<td>Aid to Construction Allowance</td>
<td>$5,000</td>
</tr>
<tr>
<td>Total Combined Bid</td>
<td>$__________________________</td>
</tr>
</tbody>
</table>

Contractors Note the Following:
A. Unit Prices: Contractor to complete Unit Cost Sheet attached to the end of this Bid Form. These prices will be used to calculate costs for any Change Orders, etc. Failure to complete the unit price sheet may render the bid non-responsive.
B. The selection of the lowest and best bidder is based on the lowest with any required alternates that are required to be removed. Lowest and best bidder can also include factoring in MBE/DBE participation and consideration of MBE prime contractors. The contract will be awarded to one contractor based upon the total combined base bid cost.
C. GDPM intends to award the entire project providing it is within the funding limits, available budget, and overall estimate for the project.

2. ALTERNATES: None identified

3. UNIT PRICES:

Contractor to complete Unit Cost Sheet. These prices will be used to calculate costs for any Change Orders, etc., increases or decreases in Contract Amount.

Owner may also use unit costs if unforeseen conditions are encountered during construction, making certain changes necessary, or if the Owner desires to order additional Work or delete part of the Work as shown. **Unit Costs will be reviewed closely and can be a determining factor in awarding the contract.** Contractor shall submit complete list of all unit prices (which may affect his work in any way) with this proposal. **All unit prices shall include Contractor's overhead and profit. Prices should include all accessories, coordination and ancillary work necessary for a complete installation.**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
<th>Labor</th>
<th>Materials</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Additional concrete walk replacement</td>
<td>SF</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>2.</td>
<td>Additional masonry tuck pointing.</td>
<td>SF</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>3.</td>
<td>Additional gypsum board repairs.</td>
<td>SF</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>4.</td>
<td>4’x8’x5/8” gypsum board material and installation at level 5 finish</td>
<td></td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>5.</td>
<td>Additional painted wood casing replace</td>
<td>LF</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>6.</td>
<td>Asphalt Paving</td>
<td>SF</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
</tbody>
</table>

4. PROJECT CHANGES

Contractor shall indicate the amount of overhead and profit to be added to changes to the project.

For ADDS to the work: Overhead_____%  Profit _____%

For DEDUCTS to the work: Overhead_____%  Profit _____%

The Time of Completion for the Contract shall not exceed Three Hundred Sixty Five days (365) days from date of Notice to Proceed.

Contractor proposes a Time of Completion for the Contract

The full name and address of all persons and parties interested in the foregoing proposals as principals are as follows:
Bid Form

Revere Road RAD Rehabilitation
Greater Dayton Premier Management

Bidder________________________________________________________________________
Address_______________________________________________________________________
Phone___________________________________Fax__________________________________

If the Contractor is entering into a partnership to perform the work, provide the following information for the partnering firm:

Bidder________________________________________________________________________
Address________________________________________
Phone___________________________________Fax__________________________________

Addendums Received:  (Please list)_________________________________________________

Bidder’s Signature_____________________________________
Typed Name_________________________________________
Title________________________________________________

Note: The Bidder will sign his bid on the line indicated above; if it will be a partnership, the firm name will be signed, followed by the signature of the partner signing. If a corporation, name will be signed followed by the signature and the official title of the officer signing name.

Bidder’s Certification

The Bidder hereby acknowledges that the following representations in this bid are material and not mere recitals:

1. The undersigned, having carefully read and examined the “Notice to Bidders”, “Instructions to Bidders”, “General Conditions”, “General Requirements”, “Specifications”, “Plans” and any addendum for: RAD Rehabilitation 2531 Revere Road - as prepared by the Berardi+Partners, Inc. Architects/Engineers., and having inspected the premises and all conditions affecting the work, the undersigned proposes to furnish all materials and perform all labor necessary for the performance and completion of the work indicated below, all in compliance with the documents named above, and further agrees that each separate item or trade or employment entered in this Proposal shall be considered as a separate bid for that kind of work. The undersigned further agrees that, if any or all of said bids are accepted, he will enter into a Contract according to the form required by the Owner for the faithful performance of the labor and the furnishing of all materials included in such bid or bids so accepted.

2. In submitting this bid it is understood that the Greater Dayton Premier Management reserves the right to reject any and all bids. It is agreed that this bid may not be withdrawn for a period of one hundred twenty (120) days subsequent to the opening of bids without the consent of Greater Dayton Premier Management.

3. Security in the sum of______________________________ Dollars ($____________) in the form of______________________________ is submitted herewith in accordance with the Specifications.
4. Attached hereto is an affidavit in proof that the undersigned has not entered into collusion with any person in respect to this bid or any other bid or the submitting of bids for the contract for which this bid is submitted. Also attached is a statement of Contractor's qualifications.

5. Bidder hereby agrees to comply with all City, State and Federal Statutes relating to Liability Insurance, Working Hour, Safety and Sanitary Regulations. Bidder further agrees that their bid amount includes all fees for permits, taxes, and insurance required or applicable to the work.

6. The Bidder will sign his bid on the line indicated below; if it will be a partnership the firm name will be signed, followed by the signature of the partner signing, his own name to be signed on the line beginning with the work "By"; if a corporation, name will be signed followed by the signature and the official title of the officer signing name.

7. The Bidder has read and understands the Contract Documents and agrees to comply with all requirements of the Contract Documents, regardless of whether the Bidder has actual knowledge of the requirements and regardless of any statement or omission made by the Bidder which might indicate a contrary intention.

8. The Bidder represents that the bid is based upon the Standards specified in the Contract Documents.

9. The Bidder has visited the project site, become familiar with the local conditions and has correlated personal observations about the requirements of the Contract Documents. The Bidder has no outstanding questions regarding the interpretation or clarification of the Contract Documents.

10. The Bidder and each person signing on behalf of the Bidder certifies, and in the case of a joint or combined bid, each party thereto certifies as to such parties organization, under penalty of perjury, that to the best of the undersigned's knowledge and belief: a) the Base Bid, any Unit Prices and any Alternate Bid in the bid having been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition as to any matter relating to such Base Bid, Unit Prices or Alternate Bid, with any other; b) unless otherwise required by law, the Base Bid, any Unit Prices and any Alternate bid in the bid have not been knowingly disclosed by the Bidder and will not knowingly be disclosed by the Bidder prior to the bid opening, directly or indirectly, to any other Bidder who would have any interest in the Base Bid, Unit Prices or Alternate Bid; c) no attempt has been made or will be made by the Bidder to induce any other individual, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

11. The Bidder will enter into and execute the Contract with Greater Dayton Premier Management (GDPM). If a Contract is awarded on the basis of this bid, and if the Bidder does not execute a Contract for any reason, other than as authorized by law, the Bidder and the Bidder's Surety are liable to GDPM as indicated in the Instructions to Bidders and in the General Conditions of the Contract.

12. The Bidder certifies that upon the award of a Contract, the Contractor will make a good faith effort to ensure that all of the Contractor's employees, while working on the project site, will not purchase, transfer, use or possess illegal drugs or alcohol or abuse prescription drugs in any way.

13. GDPM reserves the right to reject any/all bids for any reason.

If the Bidder is a Corporation, partnership or sole proprietorship, an officer, partner or principal of the Bidder, as applicable, shall print or type the legal name of the Bidder on the line provided and sign the Bid Form. If the Bidder is a joint venture, an officer, partner or principal, as applicable, of each member
of the joint venture shall print or type the legal name of the applicable member on the line provided and **sign the Bid Form**. All signatures must be original.

**Bid Form**

**Bidder's Name:**
Authorized Signature: ____________________________________________

Print name: ____________________________________________________

Title: __________________________________________________________

Company Name: ________________________________________________

Mailing Address: ________________________________________________

Telephone Number: _____________________________________________

Facsimile Number: _____________________________________________

Where incorporated: _____________________________________________

Federal Identification Number: ____________________________________

Dunn and Bradstreet Number: _____________________________________

Contact Person for Contract processing: ____________________________
(Please print)

**Additional Signature for Joint Venture:**

**Bidder's Name:**
Authorized Signature: ____________________________________________

Print name: ____________________________________________________

Title: __________________________________________________________

Company Name: ________________________________________________

Mailing Address: ________________________________________________

Telephone Number: _____________________________________________

Facsimile Number: _____________________________________________

Where incorporated: _____________________________________________

Federal Identification Number: ____________________________________

Dunn and Bradstreet Number: _____________________________________

Contact Person for Contract processing: ____________________________
(Please print)
SOLICITATION/ACKNOWLEDGEMENT/CONTRACTOR RESPONSIBILITY/OHFA REQUIREMENTS/OFFER

Issued by: Greater Dayton Premier Management 400 Wayne Ave Dayton Ohio 45410 Procurement Department

Solicitation Number: IFB# 19-02 Solicitation Type: Invitation for Bid Date Issued: December 13, 2019

SOLICITATION

Sealed bids for furnishing the services or supplies in the attached solicitation for the DMHA Revere will be received at the address specified above until 10:00 a.m., local time on Thursday January 30, 2020. Bidders/offerors should note the provision entitled Late Submissions in the Instructions to Bidders/Offerors. All offers are subject to all terms and conditions contained in this solicitation.

For information Contact: Xavier Gullatte, Procurement Department by email procurement@gdpm.org, office number 937-910-7500 and/or Fax Number 937-910-7628

ACKNOWLEDGEMENT

Please initial the following to acknowledge that you have read, understand and agree to the conditions of the identified documents. The acknowledgement be should filled out completely and included with the submission.

<table>
<thead>
<tr>
<th>General Terms &amp; Conditions</th>
<th>Statement of Bidders Qualifications</th>
<th>Drug Free Workplace</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minority Business Enterprise Goals</td>
<td>Section 3 Supplemental Instructions</td>
<td>Reference Release Forms</td>
</tr>
</tbody>
</table>

CONTRACTOR RESPONSIBILITY

In accordance with HUD Handbook 7460.8 rev 2 section 10.2-A. GDPM shall not award any contract until the prospective contractor, i.e., low responsive bidder or successful offeror, has been determined to be responsible. A responsible bidder/offeror must:

1. Have adequate financial resources to perform the contract, or the ability to obtain them;
2. Have the necessary organization, experience, accounting and operational controls, and technical skills, or the ability to obtain them;
3. Have the necessary production, construction, and technical equipment and facilities, or the ability to obtain them;
4. Be able to comply with the required or proposed delivery or performance schedule, taking into consideration all the bidder’s/offeror’s existing commercial and governmental business commitments;
5. Have a satisfactory performance record;
6. Have a satisfactory record of integrity and business ethics; and
7. Be otherwise qualified and eligible to receive an award under applicable laws and regulations, including not be suspended, debarred or under a HUD-imposed LDP.

OFFER

In compliance with the above, the undersigned agrees, if the offer is accepted within 120 calendar days from the date for receipt of offers specified above, to furnish any and all items at the prices bid.

The Offeror/Bidder acknowledges amendments: ___________ through ___________ by signing below.

Name and Address of Offeror/Bidder: ________________________________________________

Name and Title of Person Authorized to Sign Offer/Bid: ___________________________________

Telephone Number: __________________________________ Signature: _____________________ Date: _____________________
Non-Collusive Affidavit and Full Disclosure Statement

Non-Collusive Affidavit: The undersigned party hereby certifies that this proposal/bid is genuine and not collusive or sham; that said offeror has not colluded, conspired, connived or agreed, directly or indirectly, with any offeror or person to put in a sham bid or to refrain from bidding, and has not in any manner, directly or indirectly, sought by agreement or collusion, or communication, or conference, with any person, to fix the bid price or any other offeror, or to secure any advantage against the Greater Dayton Premier Management or any person interested in the proposed contract; and that all statements in said proposal or bid are true.

Disclosure: The undersigned certifies that I, nor any member of my immediate family does not now, and has not for the preceding two years, had any interest, whatsoever, whether direct, or indirect, in GDPM or any of its members or officials including but not limited to any interest which yields or has the potential of yielding directly or indirectly a monetary or other material gain or benefit with any employees, officers and commissioners of GDPM and members of their immediate family, or any interest arising from blood or marriage or from close business association, notwithstanding whether any financial interest is involved with any employees, officers and commissioners of GDPM members of their families or employment or services rendered as a member, official or officer of GDPM.

Signature: __________________________________________

Signature: __________________________________________

Title: ____________________________________________

(Company Name)
STATEMENT OF BIDDER’S QUALIFICATIONS

All questions must be answered and sign. The data given must be clear and comprehensive.

1. Business Name: ____________________________________________
2. Business Address: __________________________________________
3. Business Telephone/ Fax Numbers: _____________________________
4. Year the business was established: _____________________________
5. State in which you are incorporated: ____________________________
6. Credit available for this contract $ _____________________________
7. Contracts now on hand, gross amount $ _________________________
8. How many years have you been engaged in the contracting business under your present firm or trading name? _______
9. Type of organization (ex., corporation, partnership, proprietorship, company, LLC) ________________________________
10. Have you ever refused to sign a contract for the amount of your original bid? _______
11. Have you ever defaulted on a contract? _________
12. Have you, within the past ten (10) years, completed a minimum of five (5) projects of similar scope and complexity? __________
13. On an attached sheet, please submit a list of these projects including the contract price, description of work, and location. Also complete Five (5) Reference Release Forms to allow verification of work performance.
14. Will you upon request furnish any other information that the Greater Dayton Premier Management may require? ____________
15. The undersigned hereby authorizes and requests any person to furnish any information requested by the Greater Dayton Premier Management in verification of the recitals comprising this Statement of Bidder’s Qualifications.

________________________________________
Signature

________________________________________
Title

________________________________________
Date
CERTIFICATE AS TO CORPORATE PRINCIPAL

I _______________________________ certify that I am the ___________ of the corporation named a Contractor, herein; that ________________________ , who signed this Contract on behalf of the Contractor, was then _________________ of said corporation; that said Contract was duly signed for and in behalf of said corporation by authority of its governing body, and is within the scope of its corporate powers.

__________________________________________
(Corporate Seal)

I, HEREBY CERTIFY that, to the best of my knowledge and belief, based upon observation and inquiry, ________________________________ who signed this Contract for the ________________________________ had authority to execute the same, and is the individual who signed similar contracts on behalf of this corporation with the public generally.

__________________________________________
(The person who signed the Contract for the Local Authority must make this certification).

(Print or Type the names underneath all signatures)
REFERENCE RELEASE FORM

GDPM PROJECT# IFB 19-02 JOB TITLE DMHA Revere

Being______________________of______________________________, I hereby
Title Company Name

request _____________________________ to provide a reference on our company’s previous performance
with your company.

REFERENCE

Reference

Company Name: ________________________________________________

Company Address: ________________________________________________

Contact Person: __________________________________________________

Telephone No ___________ Fax ___________ Email_________________________

Dear Sir or Madam:

The vendor mentioned above is required to provide references in response to a bid they are submitting for a
project we are currently soliciting.

To assist GDPM in the determination of contractor responsibility, please complete the information below and return this form to the vendor. Thank you for your assistance in this manner.

1. Nature of service provided

________________________________________________________________________

2. Dollar amount of agreement $ __________________________

3. Performance: (Circle One)

   Excellent   Good   Average   Poor

4. Would you enter into an agreement with this company? ____________

5. Comments:

________________________________________________________________________

________________________________________________________________________

Title (Use Reverse Side if needed) Signature
Supplemental Instructions to Contractors for Section 3 Compliance (sec3-008)

Section 3 is a part of the U.S. Department of Housing and Urban Development (HUD) Act of 1968. This Act and HUD Regulation 24 CFR Part 135 ensures that employment and other economic opportunities generated by certain HUD financial assistance shall be directed to public housing residents, individuals of low to very low income, and to business concerns that provide economic opportunities to these individuals. Current contract is under regulation of 24 CFR part 135.

GDPM Section 3 Goals
All contractors and subcontractors shall take necessary actions to the greatest extent feasible to meet the following goals. GDPM expects a responsive Contractor to show its commitment to and compliance with Section 3 goals on each project as outlined within the below requirements and documentation.

### Section 3 Employment Goals

| Contractors and any Tier Subcontractors | New Hires and Trainees | Minimum 30% of workforce |

### Section 3 Contracting Goals

| Contractors and Any Tier Subcontractors (construction) | Subcontract Awards | Minimum 10% of the total dollar amount of contract |
| Contractors and Any Tier Subcontractors (non-construction; professional services) | Subcontract Awards | Minimum 3% of the total dollar amount of contract |

**GDPM Award Process and Contractor Commitment to Section 3 Goals**

**Procurement under the competitive proposals method of procurement (Request for Proposals (RFP)).**

A Request for Proposals (RFP) shall identify all evaluation factors (and their relative importance) to be used to rate proposals. One of the evaluation factors shall address both the preference for Section 3 business concerns and the acceptability of the strategy for meeting the greatest extent feasible requirement (Section 3 strategy), as disclosed in proposals submitted by all business concerns (Section 3 and non-Section 3 business concerns). This factor shall provide for a range of 15 to 25 percent of the total number of available points to be set aside for the evaluation of these two components. The contract award shall be made to the responsible firm (either Section 3 or non-Section 3 business concern), whose proposal is determined most advantageous, considering price and all other factors specified in the RFP.

**Procurement by sealed bids (Invitations for Bids).**

An award shall be made to the qualified Section 3 business with the highest priority ranking and with the lowest responsive bid if that bid:

(A) is within the maximum total contract price established in the contracting party’s budget for the specific project for which bids are being taken, and

(B) is not more than “X” higher than the total bid price of the lowest responsive bid from any responsible contractor.

| x=lesser of: | 10% of that bid or $9,000. |
| When the lowest responsive bid is less than $100,000. | |
| When the lowest responsive bid is: | |
| At least $100,000, but less than $200,000. | 9% of that bid, or $16,000. |
| At least $200,000, but less than $300,000. | 8% of that bid, or $21,000. |
| At least $300,000, but less than $400,000. | 7% of that bid, or $24,000. |
| At least $400,000, but less than $500,000. | 6% of that bid, or $25,000. |
| At least $500,000, but less than $1 million. | 5% of that bid, or $40,000. |
| At least $1 million, but less than $2 million. | 4% of that bid, or $60,000. |
| At least $2 million, but less than $4 million. | 3% of that bid, or $80,000. |
| At least $4 million, but less than $7 million. | 2% of that bid, or $105,000. |
| $7 million or more.................. | 11/2% of the lowest responsive bid, with no dollar limit. |
If no responsive bid by a Section 3 business concern meets the requirements above, the contract shall be awarded to a responsible bidder with the lowest responsive bid.

**Bid/Proposal Phase**

**Bidder/offeror not claiming a section 3 preference:**
1. **Bidder/offeror not claiming a Section 3 preference during the bid/proposal phase shall submit the following forms with their bid/offer. Failure to complete, execute, and submit all forms will render the bid/offer non-responsive and their bid/offer will not be considered.**
   - Form sec3-001b, List of Current (pre-bid) Employees
   - Form sec3-001e, Section 3 Strategy Commitment and Compliance Assessment

2. **Bidder/offeror claiming a Section 3 Business Concern preference:**
   **A bidder/offeror claiming a Section 3 Business Concern preference must submit Section 3 required certification. To qualify, the party wishing to claim a Section 3 preference shall complete the following forms and submit them either prior to or with the bid/offer for which qualification is sought:**
   - Form sec3-001a, Section 3 Business Concern Application and all required supporting documentation
   - Form sec3-001b, Section 3 Employee List and all required supporting documentation
   - Form sec3-001e, Section 3 Strategy Commitment and Compliance Assessment

**For all individuals, sole proprietorships, partnerships, corporations, or joint ventures with a 51% ownership claiming a Section 3 preference**
- Form sec3-001a, Section 3 Business Concern Application and all required supporting documentation
- Form sec3-001b, Section 3 Employee List and all required supporting documentation
- Form sec3-001e, Section 3 Strategy Commitment and Compliance Assessment

**For businesses claiming 30% of their current full-time workforce qualify as section 3 residents, or within three years of the date of first employment with the business concern were section 3 residents**
- Form sec3-001a, Section 3 Business Concern Application and all required supporting documentation
- Form sec3-001b, Section 3 Employee List and all required supporting documentation
- Form sec3-001c, Section 3 Contractor or Subcontractor Payroll Report completed for each F/T employee who has been employed at least one month. This includes all employees of the company
- Form sec3-001e, Section 3 Strategy Commitment and Compliance Assessment
- Form sec3-002a, Section 3 Resident Preference Claim Form and all required supporting documentation (to be completed for each Section 3 resident claimed in meeting the 30% threshold)
- Form sec3-002b, Section 3 Resident or Employee Household Income Certification (to be completed for each Section 3 resident claimed in meeting the 30% threshold)

**For businesses claiming to subcontract in excess of 25 percent of the dollar award of all subcontracts to be awarded to business concerns that meet the qualifications set forth in paragraphs (1) or (2) above**
- Form sec3-001a, Section 3 Business Concern Application and all required supporting documentation for each individual, sole proprietorship, partnership, corporation, or joint venture claimed on the subcontractor list
- Form sec3-001b, Section 3 Employee List and all required supporting documentation
- Form sec3-001d, Section 3 Contractor or Subcontractor Payroll Report (this list must demonstrate that 25% of the total dollar amount of all subcontracts to be awarded to Section 3 business concerns)
- Form sec3-001e, Section 3 Strategy Commitment and Compliance Assessment
- Form sec3-002a, Section 3 Resident Preference Claim Form and all required supporting documentation (to be completed for each Section 3 owner/employee claiming Section 3 resident status as a subcontractor)
- Form sec3-002b, Section 3 Resident or Employee Household Income Certification (to be completed for each Section 3 owner/employee claiming Section 3 resident status as a subcontractor)

**For a section 3 joint venture as an association of business concerns, one of which qualifies as a Section 3 business concern, formed by written joint venture agreement to engage in and carry out a specific business venture. As a part of joint venture, Section 3 business concern must be:**
1. Responsible for a clearly defined portion of the work to be performed and hold management responsibilities in the joint venture; and
2. Performing at least 25 percent of the work and is contractually entitled to compensation proportionate to its work.

If there is any question about the validity of a joint venture, GDPM shall request a copy of the joint venture agreement and verify its legitimacy.
- Form sec3-001a, Section 3 Business Concern Application and all required supporting documentation
- Form sec3-001b, Section 3 Employee List and all required supporting documentation
- Form sec3-001e, Section 3 Strategy Commitment and Compliance Assessment

**Completing the Section 3 Strategy Commitment**
In completing the Section 3 Strategy Commitment, the bidders/offeror's efforts shall be directed towards identifying methods to achieve success under this program, as opposed to documenting the reasons why success was not achieved. Some examples of good faith efforts include, but are not limited to the following:

**Hiring:**
Target recruitment of GDPM residents for training and employment by taking steps such as:
- Prominently placing a notice of commitments under Section 3 at the project site or other places where applications for training and employment are taken
- Contacting local job training centers, employment service agencies, and community organizations
- Developing on-the-job training opportunities or participating in job training programs
- Contacting GDPM, GDPM resident councils, GDPM resident management corporations, and GDPM residents
- Contacting GDPM for a list of agencies that may be able to provide assistance regarding opportunities for training, which can be utilized on this contract
- Advertising in the local media
- Keeping a list of Section 3 area residents who apply on their own or by referral for available positions
- Sending to labor organizations or representatives of workers with whom the recipient, contractor, or subcontractor has a collective bargaining agreement or other understanding, a notice about contractual commitments under Section 3
- Selecting Section 3 area residents, particularly GDPM residents, for training and employment positions

May 2019
Providing an ongoing monitoring of the program by the contractor and its subcontractors to ensure compliance and to identify problems or difficulties in meeting the requirements, and implement strategies to overcome the problems. Where problems or difficulties in meeting the goals are encountered, taking aggressive efforts to rectify the matter. Such action shall include, but not be limited to, convening a meeting with GDPM to advise it of the problems and proposed solutions. GDPM will offer its assistance whenever possible.

Contracting:
Target recruitment of Section 3 business concerns by taking such steps as:

- Contacting Section 3 business concerns in GDPM’s directory
- Prominently placing a notice of commitment relative to Section 3 contracting at the project site and other appropriate places
- Contacting GDPM for a list of certified firms
- Contacting other organizations which might be helpful in identifying Section 3 business concerns
- Advertising in the local media
- Dividing total work into smaller sub-tasks (i.e. by floor)
- Using multiple firms for the same type of work (i.e. two drywall subcontractors or several plumbing suppliers)
- If necessary to meet the program objectives, exercising flexibility in utilizing Section 3 business concerns in other or additional areas than initially proposed
- Providing ongoing monitoring of the program by the contractor and its subcontractors to ensure compliance and to identify problems or difficulties in meeting the requirements, and implement strategies to overcome the problems. Where problems or difficulties in meeting the goals are encountered, take aggressive efforts to rectify the matter. Such action shall include, but not be limited to, convening a meeting with GDPM to advise it of the problems and proposed solutions. GDPM will offer its assistance whenever possible.

Pre-Award Phase
Subsequent to the submission of bids/proposals, but prior to contract award, contractors may be requested to provide additional information regarding the submissions required in the Bid/Proposal Phase. Such requests may be made in instances where the contractor does not show sufficient detail in its required Section 3 Strategy Commitment, where the contractor’s required submissions do not reflect achievement of the minimum stated goals, where the contractor has not identified the name of the Section 3 subcontractor(s) in the required submissions, or where it is deemed necessary by GDPM’s Contracting Officer.

Contract Award Phase
As a condition of contract award, the contractor shall be required to enter into a Section 3 Memorandum of Understanding delineating the “greatest extent feasible” efforts required of the contractor during the term of the contract. Form sec3-009, Section 3 Memorandum of Understanding shall be used.

Contract Performance Phase
GDPM shall monitor and evaluate the contractor’s Section 3 compliance towards achieving the numerical goals relative to Section 3 employment, training, and contracting on a monthly basis throughout the contract period. The contractor shall be responsible for providing the following reports to GDPM, which shall be submitted no later than 4:30 p.m., on the first business day of each month throughout the contract period:

- Form sec3-010, Contractor’s Section 3 Employment and Training Compliance Report

The contractor shall also ensure that for each Section 3 resident hired, form sec3-002a, Section 3 Resident Preference Claim and form sec3-002b, Section 3 Resident or Employee Household Income Certification are completed and submitted to GDPM. These forms shall be completed by the resident and submitted to GDPM by the contractor with the monthly reports listed above.

The contractor shall be responsible for monitoring the compliance of any tier subcontractors. In doing so, the contractor shall require monthly reports from its lower tier subcontractors in the formats provided.

Determination of Compliance
Contractors and their subcontractors may demonstrate compliance with Section 3 by meeting the commitments stated on the Form sec3-001e, Section 3 Strategy Commitment and Compliance Assessment and by meeting the employment and contracting numerical goals set forth above. Contractors who do not meet their commitment shall have the burden of demonstrating through the submission of supporting documentation why it was not feasible to meet the numerical goals. It is expected that contractors who put forth a good faith effort will be successful in meeting the goals relative to Section 3 employment and contracting.

Effects of Non-Compliance
Contractors that do not meet the numerical goals set forth herein have the burden of demonstrating why it was not feasible to meet the goals. GDPM shall consider documentation provided by the contractor evidencing impediments encountered despite actions taken to comply. Such evidence shall be subject to the satisfaction of GDPM. The documentation may be subject to the examination of GDPM’s Board of Commissioners prior to the award of any future contract awards. Contractors found not to be in compliance with the provisions of Section 3 may be deemed ineligible for future contract awards with GDPM or at least be subject to business suspension from doing business with GDPM for one to three years.

For complete set of forms please visit: http://www.gdpm.org/doing-business-with-gdpm/section-3-overview/section-3.html

For any questions on Section 3, please e-mail procurement@gdpm.org or mail

Section 3 Procurement Office
400 Wayne Avenue
Dayton Oh 45410-1106

Telephone: 937-910-7617
Fax: 937-910-7628

May 2019
Decline to Bid for the Reason Checked

☐ I can not Comply With Specifications ☐ I can not meet delivery requirements

☐ Unable to Identify the Item(S) ☐ I do not regularly manufacture or sell the types of item(s) involved.

☐ Other (Specify)

☐ I do desire to be retained on mailing list for future procurement of this type item involved. ☐ I do not desire to be on the mailing list for future solicitations of this type item(s) involved.

(Fold and Mail to the Address Below)

FROM: [Name]

AFFIX STAMP HERE

TO: Greater Dayton Premier Management
    Attn: Compliance Department
    400 Wayne Avenue Dayton,
    Ohio 45410

Solicitation No: IFB #16-02 Hilltop Homes Partial Demolitions OH5-9 AMP 7: Dayton, OH 45417
NOTICE OF INVITATION FOR BIDS
IFB #19-02
DMHA Revere
Dayton, Ohio 45410

<table>
<thead>
<tr>
<th>GDPM CONTACT PERSON</th>
<th>Xavier Gullatte, Procurement Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-Mail: <a href="mailto:procurement@gdpm.org">procurement@gdpm.org</a> or Phone: 937-910-7500</td>
<td></td>
</tr>
</tbody>
</table>


| PUBLIC BID OPENING & BID SUBMITTAL DEADLINE DATE | Thursday, January 30, 2020 @ 10:00 a.m. |

| BID SUBMITTAL RETURN AND PUBLIC BID OPENING LOCATION | GDPM, Central Office (see Upper Level Receptionist) 400 Wayne Avenue, Dayton, Ohio 45410 |

Minority and/or women-owned and Section 3 businesses are encouraged to respond
Davis Bacon does not apply to this project
SECTION 00 0101
PROJECT TITLE PAGE
PROJECT NAME:
DMHA Revere
2531 Revere Rd. Dayton, Ohio 45420

OWNER:
Greater Dayton Premier Management
400 Wayne Ave. Dayton, Ohio 45410

ARCHITECT:
Berardi + Partners, Inc.
1398 Goodale Blvd., Columbus Oh 43212

GENERAL CONTRACTOR:
TBD

Bid Set

Date of Document 12/13/2019
Revisions:
PART 1 GENERAL

1.01 PROJECT IDENTIFICATION
   A. Project Name: DMHA Revere, located at 2531 Revere Rd. / Dayton, Ohio 45420.
   B. Project Number: 19116.
   C. The Owner, hereinafter referred to as Owner: Greater Dayton Premier Management.

1.02 PROJECT DESCRIPTION
   A. Summary Project Description: See cover sheet of drawings for project summary.
   B. Contract Scope: Construction, demolition, renovation, hazardous material removal, and facility operations during occupancy.
   C. Contract Terms: Lump Sum (GMP).

1.03 TAXES
   A. The project is subject to all applicable local, state and federal sales taxes.

1.04 PREVAILING WAGES
   A. The project is subject to the following prevailing wages and the contractor shall be responsible for obtaining the latest publication of these wages accordingly:
      1. Davis Bacon

1.05 OWNER OCCUPANCY
   A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.
   B. Owner intends to occupy the Project upon Substantial Completion.
   C. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
   D. Schedule the Work to accommodate Owner occupancy.

1.06 CONTRACTOR USE OF SITE AND PREMISES
   A. Provide access to and from site as required by law and by Owner:
      1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
      2. Do not obstruct roadways, sidewalks, or other public ways without permit.
   B. Existing building spaces may not be used for storage unless permission is granted from the owner in writing.
   C. Time Restrictions:
      1. Limit conduct of especially noisy exterior work to the hours of 9:00 am. - 5:00 pm.
      2. Limit conduct of especially noisy interior work to the hours of 9:00 am. - 5:00 pm.
   D. Utility Outages and Shutdown:
      1. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
      2. Limit shutdown of utility services to 3 hours at a time, arranged at least 48 hours in advance with Owner.
      3. Prevent accidental disruption of utility services to other facilities.

1.07 PROCUREMENT TIMETABLE
   A. The Owner reserves the right to change the schedule or terminate the entire procurement process at any time.
1.08 PERFORMANCE REQUIRED DURING BIDDING.
   A. By submitting a bid for any Section of the work for this project, each sub-contractor must have actually read all of Divisions 00 & 01 prior to reading the technical specifications covering their specific work and reviewing the drawings.
   B. Notify in a timely manner to the Architect/Engineer any discrepancies or inconsistencies in the construction drawings and specifications which will impair or prevent achieving the final design requirements of the Project.
   C. Submit any product of equal to or greater performance for prior approval. Review ‘Submittal Requirements’ identified by this project manual.

1.09 PERFORMANCE REQUIRED DURING CONSTRUCTION.
   A. Reread all of Division 00 & 01 and review the drawings prior to submittal of shop drawings and initiating any related construction.
   B. Submit shop drawings, product data and other information required to accurately portray the performance of the product in accordance with the Contract Documents.
   C. Manufacturer’s Installation Requirements (Manuals) are referenced as part of project requirements in order to ensure the accurate installation and safe/efficient operation of their products.
   D. Notify Prime Contractor if any work prior to the installation of your work is not at a quality standard to receive your Work.
   E. Follow the directions of the Prime Contractor.
   F. Complete the Work in a prescribed manner and time frame to achieve the desired results required by the Contract Documents.

1.10 JOB SITE SAFETY.
   A. Notify the Prime Contractor of any unsafe conditions.
   B. Follow the manufacturer’s operations manual for any operation of equipment and required rough-in services for installation of product. Rough-ins services which may not be shown by the drawings will be required to be provided as part of the Contract.
   C. Do not drink or consume any matter labeled unsafe or mind altering, while completing the prescribed work for project within your required category of the work.

1.11 REFERENCE STANDARDS.
   A. All common standards, laws and protocols which represent quality and are within the boundaries of the common understanding within the industry shall be applied to the project. If you don’t know what the limits of your work scope are ask before preparing a bid.

1.12 DOCUMENTATION REQUIRED PRIOR TO CONSTRUCTION START
   A. The following must be documented by the Prime Contractor to the Architect that prior to proceeding with the Work they have contracted with sub-contractors and suppliers that they possess the ability to:
      1. Read, comprehend and speak the English language
      2. Understand that their contractual obligation to perform the Work is governed by both the Project Manual (Specifications) and Drawings, together with all referenced instructions and those standards and codes common to the Construction Industry or specific trade;

1.13 PROCUREMENT DOCUMENTS
   A. Availability of Documents: Complete sets of procurement documents may be obtained:
      1. Documents may be downloaded from the Architect’s File Transmission Protocol (FTP) site or Cloud. Contact the Architect for specific requirements for access.
      2. From Owner at the Project Manager’s address listed above.
PART 2 PRODUCTS (NOT USED)
PART 3 EXECUTION (NOT USED)

END OF SECTION
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1. **ARTICLE I: CONTRACTOR RESPONSIBILITIES**

1.1. The Contractor shall perform the Work in a workmanlike manner, consistent with the standards of skill and care exercised by entities licensed to perform (where required by Ohio and/or Federal Law) and regularly performing comparable work in the same or similar locality under the same or similar circumstances.

1.2. The Contractor shall perform the Work in accordance with the Contract Documents.

1.3. The Contractor shall furnish all labor, services, materials, tools, equipment, superintendence, and transportation necessary for performance of the Work. Contractor shall also furnish all necessary water, heat, light, and power not made available to the Contractor by GDPM.

1.4. The Contractor shall perform on the site and with its own organization, work equivalent to at least twelve percent (12%) of the total amount of work to be performed under the order. This percentage may reduce by a supplemental agreement to this Construction Contract if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be the advantage of GDPM.

1.5. At all times during performance of this Construction Contract and until the work is completed and accepted, the Contractor shall directly superintend the work or assign and have on the work site a competent superintendent whose qualifications and experience are satisfactory to GDPM and has authority to act on behalf of the Contractor. Further, Contractor must remain on-site or be immediately available if contacted.

1.6. The Contractor shall be responsible for all damages, including, but not limited to, damages to persons or property that occur as a result of the Contractor's breach of this Construction Contract, fault or negligence and shall take proper safety and health precautions to protect the Work, the workers, the public, and the property of others.

1.7. The Contractor shall also be responsible for all storage, protection and cleaning of materials delivered and Work performed on the Project, until Substantial Completion and acceptance of the entire Project, except for any completed unit of Work which may have not been accepted under the Construction Contract.

1.8. The Contractor shall lay out the work from base lines and bench marks indicated in the drawings and be responsible for all lines, levels, and measurements of all work executed under the Contract Documents.

1.8.1. The Contractor shall verify the lines, bench marks, figures and dimensions indicated in the Contract Documents before laying out the work and will be held responsible for any error(s) resulting from its failure to do so.

1.9. The Contractor shall confine all operations (including storage of materials) on GDPM's premises to areas authorized or approved by GDPM.

1.10. The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. At no time shall Contractor use GDPM trash receptacles.

1.10.1. After completing the Work and before final inspection, the Contractor shall:

- Remove from the premises all scaffolding, equipment, tools, materials (including rejected materials) that are not the property of GDPM and rubbish caused by its work;
- Leave the work area in a clean, neat, and orderly condition satisfactory to GDPM;
• Perform all specified tests; and
• Deliver the installation in complete and operating condition.

1.11. The Contractor must perform the Work so as to not interfere with, disturb, hinder, or delay the services of separate consultants or the work of separate contractors.

1.11.1. The intent of this Section, 1.11, is to benefit any separate consultants and separate contractors and to demonstrate that the separate consultants or separate contractors are intended third-party beneficiaries of Contractor’s obligations under the Contract.

1.11.2. The Contractor must cooperate and coordinate fully with all separate consultants and separate contractors and must freely share all of the Contractor’s Project-related information with them to facilitate the timely and proper performance of the Work and of the services and work of the separate consultants and separate contractors.

1.11.3. The Contractor must afford every separate consultant and separate Contractor proper and safe access to the Site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of their services and work.

1.11.4. If the Contractor damages the property or work of any separate consultant or separate Contractor caused by Contractor or by failure to perform the Work with due diligence, delays, interferes with, hinders, or disrupts the services of any separate consultant or separate Contractor who suffers additional expense and damage as a result, the Contractor is responsible for that damage, injury, or expense.

1.12. The Contractor shall remove any snow and ice as may be required for reasonably safe access to the Project, including, without limitation, building entries, driveways, parking lots, and sidewalks.

1.13. If the proper execution or result of any part of the Work depends upon work performed or services provided by GDPM, a separate consultant, or a separate Contractor, the Contractor must inspect that other work and appropriate instruments of service, and promptly report to GDPM in writing any defects or deficiencies in that other work or services that render it unavailable or unsuitable for the proper execution and results of the Work.

1.13.1. The Contractor’s failure to inspect and promptly report any issues in writing will constitute an acceptance of the other work and services as fit and proper for integration with the Contractor’s Work unless in the opinion of GDPM, the defects and deficiencies in the other work and appropriate instruments of service were not reasonably discoverable at the time of the Contractor’s inspection.

1.14. The Contractor shall not delay the Work on account of any claim, dispute, or action between the Contractor and GDPM or the Contractor, a Separate Consultant or Separate Contractor.

1.15. The Contractor shall develop and keep a Construction Progress Schedule and prepare and keep current a schedule of submittals that is coordinated with the Construction Progress Schedule for GDPM’s acceptance.

1.16. The Project’s regular work hours shall be between 8:00 am and 5:00 pm, or as determined and approved by GDPM.

1.16.1. The Contractor may modify the regular work hours only if Contractor receives written authorization from GDPM’s Project Manager and/or Construction Contract Administrator.
1.17. The Contractor shall coordinate the Work with the activities and responsibilities of the Project’s architect or engineer ("A/E’’), GDPM and Contractor’s surety to achieve the Substantial Completion date and Contract Completion.

1.18. The Contractor shall keep a daily log containing a record of weather, number of workers on Site for the Contractor, identification of equipment, Work accomplished, problems encountered and other similar relevant data. Such information must be made available to GDPM immediately upon request.

1.19. The Contractor hereby represents and agrees that, prior to submitting its bid or quote to perform the Work on the Project, it has had a competent person carefully and diligently review each part of the Contract Documents, including the Divisions of the Specifications and parts of the Drawings that are not directly applicable to the Work.

1.19.1. Contractor further represents and agrees that, based upon its careful and diligent review of the Contract Documents, that it is not aware of any conflicts, inconsistencies, errors, or omissions in the Contract Documents for which it has not notified GDPM or the A/E.

1.19.2. If there are any such conflicts, inconsistencies, errors, or omissions in the Contract Documents, the Contractor shall notify GDPM of such in writing and Contractor shall:

• Provide the labor, equipment, or materials of the better quality or greater quantity; and/or
• Comply with the more stringent requirements.

1.19.3. The Contractor will not be entitled to any additional compensation for any conflicts, inconsistencies, errors, or omissions that would have been discovered by such careful and diligent review.

1.20. The Contractor hereby represents and agrees that the Project is a public project involving public funds.

1.20.1. The Contractor further understands that GDPM expects and requires that each Contractor adhere to the highest ethical and performance standards.

1.20.2. Accordingly, Contractor hereby pledges and agrees that:

• It will act at all times with absolute integrity and truthfulness in its dealings with GDPM and the A/E;
• It will use its best efforts to cooperate with GDPM and the A/E and all other contractors and consultants on the Project and at all times will act with professionalism and dignity in its dealings with GDPM, the A/E, and other contractors;
• It will assign only competent supervisors and workers to the Project, each of whom is fully qualified to perform the tasks that are assigned to him/her; and
• It has read, understands and will comply with the terms of the Contract Documents.

1.21. Emergency

1.21.1. In the event of an emergency affecting the safety of the Project, other property, or individuals, the Contractor, without special instructions or authorization, shall act to prevent the threatened damage, injury, or loss.
1.21.2. If the Contractor believes that it is entitled to an adjustment of the Contract Sum or Contract Times, or both, on account of its actions in response to any emergency, the Contractor may request a Change Order by giving written notice no later than 48-hours after the emergency.

1.22. The Contractor's responsibilities will terminate when all work has been completed, the final inspection made, and the Work accepted by the Contracting Officer. The Contractor will then be released from further obligation except as required by the warranties specified elsewhere in the contract.

2. **ARTICLE II: HOUSING AUTHORITY RIGHTS AND RESPONSIBILITIES**

2.1. GDPM shall designate a Project Manager and/or Construction Contract Administrator for the Project.

2.2. GDPM shall have access to the Work and Site at all times, whether the Project is in preparation or progress.

2.3. GDPM is not responsible for construction means, methods, manners, techniques, sequences, procedures, or for safety precautions and programs in connection with the Work, or for the Contractor's failure to carry out the Work in conformity with the Contract Documents.

2.4. Upon the date indicated in the Notice to Proceed, or other document provided by GDPM that authorizes Contractor to commence Work, GDPM shall provide the Site to the Contractor in a condition to permit the Contractor to perform the Work.

2.5. If the Site provided by GDPM is not in a condition to permit the Contractor to perform the Work, Contractor shall notify, in writing, GDPM's Project Manager and/or Construction Contract Administrator within one working day hours of the Notice to Proceed, or other document as applicable, and identify the conditions which are preventing Contractor from performing the Work.

3. **ARTICLE III: A/E'S DUTY, RESPONSIBILITY AND AUTHORITY**

3.1. The A/E for this Contract and any successor shall be designated in writing by GDPM.

3.2. The A/E's duties and responsibilities may include, but shall not be limited to:

   3.2.1. Attend and conduct the Construction Progress Meetings.

   3.2.2. Making periodic visits to the work site and on the basis of his/her on-site inspections, issuing written reports to GDPM which shall include all observed deficiencies.

      3.2.2.1. The A/E shall electronically send a copy of the report to GDPM and to the Contractor's designated representative at the site.

      3.2.2.2. Said report shall include a summary of up-to-date project completion information and summary of any changes to the Work to date.

   3.2.3. Making modifications in drawings and technical specifications and assisting the Contracting Officer in the preparation of change orders and other contract modifications for issuance to the Contracting Officer.

   3.2.4. The A/E may authorize minor changes or alterations in the Work that are consistent with the intent of the Contract Documents and do not involve adjustment of the Contract Sum or Contract Time, or both.
3.2.4.1. The A/E has no authority to authorize the Contractor to perform additional or extra Work for which the Contractor may seek adjustment of the Contract Sum or the Contract Time, or both.

3.2.5. Reviewing and making recommendations with respect to:

- The Contractor's Construction Progress Schedules;
- The Contractor's shop and detailed drawings; and
- The Contractor's price breakdown and progress payment estimates.

3.2.6. Assisting in inspections, signing Certificates of Completion, and making recommendations with respect to acceptance of work completed under the contract; and

3.2.7. Approve or certify applicable forms required under the Contract Documents.

3.3. Site Visits and Observation

3.3.1. The A/E shall notify, advise, and consult with GDPM and protect GDPM against Defective Work throughout completion of the Project, which includes the Correction Period, and for such time period GDPM may extend A/E's services.

3.3.1.1. The A/E should designate a field representative, subject to GDPM's approval, to attend meetings, to observe and check the progress and quality of the Work, and to take action as necessary or appropriate to achieve conformity with the Contract Documents.

3.3.1.2. The A/E shall have its consultants attend to the Project at intervals required by its agreement or required by GDPM.

3.3.2. The A/E is authorized to disapprove or reject Defective Work. The A/E shall immediately notify GDPM, in writing, any time the A/E disapproves or rejects an item of Work.

3.3.3. The A/E is not responsible for construction means, methods, manners, techniques, sequences, procedures, or for work safety precautions and programs in connection with the Work, or for the Contractor's failure to carry out the Work in conformity with the Contract Documents.

3.4. Testing and Inspection Services

3.4.1. Unless otherwise specified in the Contract Documents, the A/E shall apply for, secure, and pay for the costs of structural testing and special inspections under the Ohio Building Code; testing including geotechnical analysis, environmental testing and analysis, concrete, masonry, structural steel, reinforcing steel, welding, bolts, steel connections, HVAC systems and controls, plumbing and piping, air, and water balancing and testing, or other testing, or approvals required by Applicable Law.

3.5. A/E Review and Approval of Work

3.5.1. Any information the Contractor submits to the A/E is for the sole purpose of determining whether the Work and information is generally consistent with the Contract's intent, and will not relieve the Contractor of its sole responsibility for the performance, preparation, completeness, and accuracy of the Work and information.

3.5.2. By reviewing information submitted by the Contractor, A/E is not taking on responsibility for construction means, methods, manners, techniques, sequences, procedures, or for work safety precautions and programs in connection with the Work.
3.6. Limitation of A/E's Authority

3.6.1. The A/E shall serve as the technical representative for GDPM with respect to architectural, engineering, and design matters related to the Work performed under the Contract.

3.6.2. Subject to the Contractor's responsibility under ARTICLE I, the A/E may provide direction on Contract performance.

3.6.3. Such direction shall be within the scope of the Contract and may not be of a nature which:

- Institutes additional work outside of the scope of the Contract;
- Constitutes a change (except as provided for in 3.2.4);
- Causes an increase or decrease in the cost of the Contract;
- Alters the Construction Progress Schedule;
- Changes any of the other express terms or conditions of the Contract;
- Accepts any defective or non-conforming services, Work, or vendor-furnished items;
- Makes any settlements on GDPM's behalf;
- Assumes any responsibilities of the Contractor or Subcontractors; or
- Binds GDPM to any authorizations under, modifications of, or amendments to the Contract Documents other than as expressly provided herein.

3.7. The Contractor acknowledges and agrees that GDPM's legal counsel may from time to time provide legal services to the Project and that in doing so may communicate with the A/E, as GDPM's representative on the Project.

3.7.1. The Contractor agrees that such communications will be privileged communications and, if there is a Claim contemplated or pending, any written communications will be protected by the attorney client privilege and considered confidential work product.

4. ARTICLE IV: PRECONSTRUCTION ACTIVITIES

4.1. Pre-construction Conference

4.1.1. Within ten calendar days, unless otherwise indicated by GDPM, of Contract execution, and prior to the commencement of work, the Contractor shall attend a preconstruction conference with GDPM representatives, GDPM's A/E, and other interested parties convened by GDPM.

4.1.1.1. The conference will serve to acquaint the participants with the general plan of the construction operation and all other requirements of the Contract.

4.1.1.2. The A/E will be responsible for taking minutes and distributing said minutes within seventy-two (72) hours of completion of the meeting.

4.1.1.3. GDPM will provide the A/E and Contractor with the date, time, and place of the conference. Generally, the information will be contained in the issued Notice to Proceed.
4.2. Certificate of Insurance

4.2.1. Before commencing work, the Contractor and each Subcontractor shall furnish GDPM with certificates of insurance showing the minimum insurance coverage is in force and will insure all operations under the Contract.

4.3. Building and Trade Permits, Licenses and Codes

4.3.1. The Contractor shall give all notices and comply with all applicable laws, ordinances, codes, rules, and regulations.

4.3.1.1. Notwithstanding the requirement of the Contractor to comply with the drawings and specifications in the Contract, all Work installed shall comply with all applicable laws, ordinances, codes, rules, and regulations, as may be amended by any waivers.

4.3.1.2. Before installing the Work, the Contractor shall examine all drawings and the specifications for compliance with applicable laws, ordinances, codes, rules, and regulations bearing on the Work and shall immediately report, in writing, any discrepancy it may discover to GDPM's Project Manager and/or Construction Contract Administrator and the A/E. (HUD term had 'contracting officer')

4.3.1.3. If required by any governing jurisdiction, GDPM will modify the Contract by change order so that the Work on the Project will conform to the applicable laws, ordinances, codes, rules, and regulations.

4.3.1.4. If the Contractor installs any Work that does not comply with all applicable laws, ordinances, codes, rules, and regulations before providing notice hereunder to GDPM and receiving direction from GDPM, Contractor shall be responsible for all costs resulting from any removal, demolishing, and disposing of any Work that must be replaced or repaired.

4.3.2. Notwithstanding the provisions below, the Contractor shall secure and pay for all permits, fees, and licenses necessary for the proper execution and completion of Work.

4.3.2.1. Where GDPM can arrange for the issuance of all or part of these permits, fees, and licenses, without cost to the Contractor, the Contract amount shall be reduced accordingly.

4.4. Plan Approval and Permits

4.4.1. The A/E shall facilitate the required structural, plumbing, HVAC, and electrical plan reviews during the design phase, as required by the governing jurisdiction for securing an overall building permit to start construction.

4.4.2. The Contractor shall schedule and attend all intermediate and final inspections required for any permit applicable to the Work or any governing jurisdiction.

4.4.3. If applicable, the Contractor shall schedule with the State Fire Marshal or local fire authority for the life safety inspection for occupancy permits.

4.4.4. The Contractor shall give the A/E and GDPM reasonable notice of the dates and times for any inspections.

4.4.4.1. The Contractor shall pay for all initial inspections and re-inspections required as a result of Contractor's failure to receive approval for its Work.
4.5. Trade Permits and Licenses

4.5.1. The Contractor shall secure and pay the fees for any permit, inspection, or license applicable to the Contractor’s particular trade.

4.6. Local Permits:

4.6.1. The Contractor shall secure and pay the fees for any permits, inspections, licenses, capacity charges, or tap fees required by local authorities having jurisdiction over the Work.

4.6.2. The Contractor shall give the A/E and GDPM reasonable notice of the date(s) arranged for inspections.

4.7. National Pollutant Discharge Elimination System (NPDES) Storm Water General Permit:

4.7.1. If applicable, the A/E shall secure the NPDES general permit by submitting a Notice of Intent (NOI) application form to the Ohio Environmental Protection Agency at least 45 days prior to the start of construction.

4.7.2. The Contractor shall be a co-permitee, if required under Applicable Law.

4.7.3. The A/E shall prepare and certify the storm water pollution prevention plan to provide sedimentation and erosion controls at the Work.

4.8. The A/E shall prepare and process the required Notice of Termination (NOT) prior to Contract Completion.

5. ARTICLE V: CONSTRUCTION REQUIREMENTS

5.1. Commencement of Work on Site

5.1.1. Unless GDPM agrees otherwise in writing, the Construction Stage will commence with GDPM issuing the Notice to Proceed and will terminate upon Substantial Completion, Certificate of Occupancy issuance, and the Completion of all punch list items delivered to Contractor by GDPM which must occur no later than 10 days after date of Substantial Completion.

5.1.2. Notice to Proceed:

5.1.2.1. The Contractor shall begin work upon the date indicated in a written Notice to Proceed from GDPM or its designee.

5.1.2.2. The Contractor shall not begin work prior to receiving such notice.

5.1.2.3. If GDPM Board of Commissioners’ approval is required, the Notice to Proceed shall be issued within 180 days of GDPM Board of Commissioner’s approval.

5.1.2.4. When applicable and if the Notice to Proceed is not issued within 180 days of GDPM Board of Commissioners’ approval, GDPM may, in its sole discretion, terminate the Contract without recourse from the Contractor.\(^1\)

5.2. Environmental Controls

5.2.1. The Contractor shall protect its Work and materials from damage from water, moisture, and other weather, including damage from water run-off from other property or structures, and damage from heat, cold, and humidity.
5.2.2. Contractor is not authorized to use permanent HVAC system without express written authorization from GDPM

5.2.3. Until the permanent HVAC system is complete and available for use:
   5.2.3.1. The Contractor shall make arrangements and pay for installation and maintenance of temporary heating and ventilating systems; and
   5.2.3.2. The Contractor shall pay the costs incurred in operating the temporary heating and ventilating systems.

5.2.4. When the permanent HVAC system is complete and available for use:
   5.2.4.1. The Contractor shall start up and maintain operation of the permanent HVAC system, including filters, and promptly remove temporary heating and ventilating systems.
   5.2.4.2. If the Project consists entirely of new construction, the Contractor shall pay the costs of energy consumed in operating the permanent HVAC system until Substantial Completion.
   5.2.4.3. From the date of Substantial Completion, GDPM shall pay the cost of operating the permanent HVAC system for the occupied portion of the Project.
   5.2.4.4. Use of the permanent HVAC system during construction shall not change, modify or reduce the Contractor's warranty and service obligations under the Contract Documents.

5.3. Construction Procedures

5.3.1. The Contractor is solely responsible for and has control over all construction means, methods, techniques, sequences, and procedures, for safety precautions and programs in connection with the Work, and for coordinating all portions of the Work.

5.3.2. If the Contract Documents give instructions that affect construction means, methods, manners, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety of them and, except as expressly stated herein, be fully and solely responsible for the jobsite safety of the means, manners, methods, techniques, sequences, or procedures.

5.3.3. If the Contractor determines that the means, methods, manners, techniques, sequences, or procedures specified in the Contract Documents may not be safe, the Contractor shall give timely written notice to GDPM.

5.3.4. The Contractor shall not proceed with that portion of the Work without further written instructions from GDPM.

5.3.5. Additional Contractor Responsibilities

5.3.5.1. The Contractor shall lay out and coordinate all lines, levels, elevations, and measurements for all of the Work, coordinate and verify existing conditions, and notify the A/E and GDPM of discrepancies and conflicts before proceeding with installation or excavation.

5.3.5.2. The Contractor shall perform all cutting, fitting, or patching required for the Work and shall not endanger the Project by cutting, excavating, or otherwise altering the Work or any part of it.
5.3.5.3. If the Design requires sleeves for completing the specified Work, the Contractor and all Subcontractors shall coordinate to furnish and install the sleeves.

- The Contractors are responsible for the exact location of and size of all holes and openings required to be formed or built for the Work.

5.3.5.4. The Contractor’s patching shall match and blend with the existing adjacent surfaces.

5.3.5.5. In addition to the items herein, The Contractor is responsible for all items in Article I, Contractor’s Responsibilities.

5.4. Utilities

5.4.1. Availability and Use of Utilities

5.4.1.1. If GDPM has existing access to utilities, GDPM shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and service as specified herein so long as the utility use does not interfere with GDPM’s operations.

5.4.1.2. Unless otherwise provided in the Contract, the amount of each utility service consumed shall be charged to or paid for by the Contractor at prevailing rates charged to GDPM or where the utility is produced by GDPM, at reasonable rates as determined by GDPM.

5.4.1.3. The Contractor shall carefully conserve any utilities furnished provided by GDPM without charge.

5.4.1.4. The Contractor, at its expense and in a manner satisfactory to GDPM, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of each utility used for the purpose of determining charges.

5.4.1.5. Before final acceptance of the Work by GDPM, the Contractor shall remove all the temporary connections, distribution lines, meters, appurtenances and associated paraphernalia.

5.4.2. The Contractor shall comply with the Ohio Revised Code and any local rules, regulations and ordinances concerning utilities.

5.4.2.1. In addition, before starting excavation or trenching, the Contractor shall determine the location of any underground utilities and notify any public authority or utility having jurisdiction over the Project and secure any required approval.

5.4.3. The Contractor shall give at least 2 business days in advance of excavation to GDPM of underground utilities registered with the Ohio Underground Utility Protection Services ("OUPS").

5.4.3.1. The Contractor is required, within 48 hours’ notice, to stake, mark, or otherwise designate the location for its utilities in the construction area together with its approximate depth.

5.4.3.2. In the event Contractor damages a utility line, the Contractor shall immediately notify the appropriate utility company or government official, the A/E and GDPM of the problem.

5.4.4. Water and Drainage

5.4.4.1. The Contractor shall provide water necessary for the Work until the permanent plumbing system is available for use.
5.4.4.2. The Contractor shall provide temporary drainage and dewatering necessary for the Work and shall employ pumps, trenches, drains, sumps, and other necessary elements required to provide satisfactory working conditions for the protection, execution, and completion of the Project.

5.4.4.3. The Contractor shall make arrangements and pay for installation and maintenance of temporary plumbing systems until the permanent plumbing system is available for use.

5.4.4.4. When the permanent plumbing system is complete and available for use:

- The Contractor shall start up and maintain operation of the permanent plumbing systems, and make arrangements and pay for removal of temporary plumbing systems.
- If the Project consists entirely of new construction, the Contractor shall pay the costs of water consumed and sewage charges until Substantial Completion.
- If the Project is a renovation of an existing building or structure, addition(s) to an existing building or structure, or any combination of new construction and renovation work that does not allow separate metering of utilities, GDPM shall pay the costs of water consumed and sewage charges.
- If separate metering of utilities is available, the Contractor and GDPM will pay the costs of their respective use.

5.4.4.5. After the date of Substantial Completion, GDPM shall pay the costs of water consumed and sewage charges for the occupied portion of the Project.

5.4.4.6. Use of the permanent plumbing system during construction shall not change, modify, or reduce the Contractor's warranty and service obligations under the Contract Documents.

5.4.5. Electric Service

5.4.5.1. The Contractor shall provide temporary light and power; pay the charges for temporary electric service, installation, and removal if required.

5.4.5.2. If the Project consists entirely of new construction, the Contractor shall pay the cost of energy consumed until Substantial Completion.

5.4.5.3. If the Project is a renovation of an existing building or structure, addition(s) to an existing building or structure, or any combination of new construction and renovation work that does not allow separate metering of utilities, GDPM shall pay the cost of energy consumed. GDPM will charge Contractor the cost of the energy consumed in accordance with 5.4.6.

5.4.5.4. If separate metering of utilities is available, the Contractor and GDPM will pay the costs of their respective use.

5.4.5.5. From the date of Substantial Completion, GDPM shall pay the cost of energy consumed for the occupied portions of the Project.

5.4.5.6. Use of the permanent electrical system during construction shall not change, modify, or reduce the Contractor’s warranty and services obligations under the Contract Documents.
5.4.6. Payment of Utility Services

5.4.6.1. Unless otherwise expressly stated in the Contract Documents, Contractor shall reimburse GDPM the cost of utility services during the Construction Period.

5.4.6.2. Unless otherwise expressly stated in the Contract Documents, payment for reimbursement of GDPM for the cost of utility services during the Contract Period shall be made directly to GDPM.

5.4.6.3. If payment is not received, GDPM may deduct the cost of utility services from payments otherwise due to the Contractor.

5.4.6.4. If the payments otherwise due to the Contractor are not sufficient to fully reimburse GDPM, either Contractor or its surety shall make whatever payments are necessary to fully reimburse GDPM.

5.4.6.5. Process for Payment: Reimbursement from the contractor shall be performed on a quarterly basis unless a more frequent payment schedule is agreed upon between GDPM and the contractor prior to start of the project.

5.5. Hoisting Facilities

5.5.1. The Contractor shall erect and maintain any hoisting equipment required for its Work.

5.5.2. If the electric service requirements of hoisting facilities differ from that available at the Site, the Contractor shall provide and pay for all necessary connections.

5.5.3. If a permanent elevator is identified in the Contract Documents to be used for hoisting materials or personnel during construction, the Contractor shall furnish an extended warranty and service contract in effect until the expiration of the Correction Period.

5.6. Interruption of Existing Services

5.6.1. Whenever it becomes necessary to interrupt existing services in use by GDPM or its tenants, including, but not limited to, sewer, water, gas, steam lines, electric, telephone, Wi-Fi, and cable service, the Contractor shall continue the associated Work on a non-stop 24-hour per day basis until that Work is completed and the service restored, or perform the associated Work at an alternate time as required by and in coordination with GDPM.

5.6.2. Before beginning that Work, the Contractor shall apply in writing to, and receive approval in writing from GDPM to establish a time when interruption of the service will cause a minimum of interference with the activities of GDPM and its tenants.

5.7. Construction Supervision

5.7.1. Unless waived by GDPM in writing, the Contractor shall provide continuous supervision at the Site through a competent project manager or superintendent when any Work is being performed.

5.7.2. The Contractor's project manager and superintendent shall each have responsibility and authority to act on behalf of the Contractor.

5.7.2.1. All communication to the Contractor's project manager and superintendent shall be binding as if given directly by the Contractor.

5.7.3. The Contractor shall submit an outline of the qualifications and experience of the Contractor's proposed project manager and superintendent, including references, to GDPM no later than 2 days after request from GDPM.
5.7.3.1. The Contractor shall submit an outline of the qualifications and experience of the Subcontractor's proposed project manager and proposed superintendent, including references, to GDPM no later than 2 days after GDPM's request.

5.7.3.2. GDPM may reject the Contractor or Subcontractor's proposed project manager and/or proposed superintendent.

5.7.3.2.1. If GDPM does not notify the Contractor of the rejection within 30 days after receiving the required information, it shall then indicate that GDPM does not have an objection, but does not affect GDPM's rights under the Contract Documents or any other provision relative to the project manager or superintendent.

5.7.3.3. If GDPM rejects the Contractor or Subcontractor's proposed project manager or proposed superintendent, the Contractor shall replace, or cause the Subcontractor to replace the project manager or superintendent (as appropriate) with someone acceptable to GDPM at no additional cost.

5.7.4. If GDPM does not object the proposed project manager or superintendent, the Contractor and its Subcontractor shall not replace their respective project managers and superintendents without prior written approval of GDPM.

5.8. Construction Progress Schedule

5.8.1. The Contractor shall, no later than seven days of the issuance of the Notice to Proceed or another period of time determined by the GDPM, prepare and electronically submit to GDPM, for approval, three copies of a practicable viable schedule showing the order in which the Contractor proposes to perform the Work, the dates on which the Contractor contemplates starting and completing the several salient features of the Work (including acquiring labor, materials, and equipment).

5.8.2. The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period.

5.8.3. The Chart must be in a Critical Path Method (CPM) format.

5.8.4. If the Contractor fails to submit a schedule within the time prescribed, GDPM may withhold approval of progress payments or take other remedies under the Contract until Contractor submits the required schedule.

5.8.5. The Contractor shall monitor the Work for conformance with the Construction Progress Schedule and shall initiate revisions as required herein.

5.8.6. The Contractor shall enter the actual progress on the chart as required by GDPM, and immediately provide electronic copies of the annotated schedule to GDPM.

5.8.6.1. If GDPM determines, upon the basis of inspection conducted, herein that the Contractor is not meeting the approved schedule, the Contractor shall take steps necessary to improve its progress, including those that may be required by GDPM, without additional cost to GDPM.

5.8.6.2. In this circumstance, GDPM may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules in chart form as GDPM deems necessary to demonstrate how the approved rate of progress will be regained.
5.8.7. Failure of the Contractor to comply with the requirements of GDPM shall be grounds for a determination by GDPM that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the Contract.

5.8.7.1. Upon making this determination, GDPM may terminate the Contractor's right to proceed with the work, or any separable part of it.

5.8.8. Unless otherwise agreed to in writing, The Contractor shall develop the Construction Progress Schedule using commercially available, personal computer software acceptable to GDPM and shall submit all baseline and updated schedules to GDPM in the schedule's native format.

5.8.9. This submission shall be in electronic format.

5.8.10. The Construction Progress Schedule shall not exceed the time limits under the Contract Documents. Further, the Progress Schedule shall provide for reasonable, efficient, and economical execution of the Project and shall relate to the entire project to the extent required by the Contract Documents.

5.8.10.1. In the event that a Construction Progress Schedule submitted by Contractor shows a completion date that extends beyond the Contract Time permitted to Contractor in the Contract Documents, such Construction Progress Schedule shall not be deemed to modify the Contract Time permitted in the Contract Documents.

5.8.10.2. The Contractor shall use the Construction Progress Schedule to plan, organize, and execute the Project, record and report actual performance and progress, and show how it plans to coordinate and complete all remaining work by contract completion within applicable milestones.

- The Project participants shall use the Construction Progress Schedule as a tool for scheduling and reporting sequences and/or the progress of the Work.
- The Contractor shall provide a clear graphics legend and other data including without limitation, milestone dates, constraints, and other items required by the Project and GDPM.
- Each submission shall show GDPM's contract number and project name.

5.8.11. The Contractor shall provide the following in each schedule:

5.8.11.1. Activity identification and description of each activity broken down to a maximum duration that is appropriate for the activity;

5.8.11.2. Responsibility of the Contractor;

5.8.11.3. Contractor's resources and crew size for each activity; and

5.8.11.4. Provide early start, early finish, late start, late finish dates.

5.8.11.5. The Construction Progress Schedule shall show all submittal dates, review and approval durations for coordination drawings, Shop Drawings, other action submittals and mock-up Work.

5.8.12. The Contractor shall submit the initial and all updates of the Construction Progress Schedule in graphic and tabular form to GDPM.

5.8.12.1. With each monthly schedule update, the Contractor shall include a list of all changes to the previously approved baseline schedule or monthly updated schedule.
5.8.13. The Construction Progress Schedule shall be managed using early start dates and early finish dates.

5.8.13.1. The Contractor must exhaust all existing float before claiming additional time for a Change Order.

5.8.14. The Contractor's failure to submit and properly maintain an approved Construction Progress Schedule may result in withholding payment in accordance with the Contract Documents.

5.8.15. For each Progress Meeting, the Contractor shall provide a 2-6 week look-ahead schedule, as appropriate for the Project.

5.8.16. On a monthly basis, the Contractor shall prepare and submit to GDPM a written report describing:

5.8.16.1. Activities begun or finished during the preceding month;

5.8.16.2. Activities in progress and expected completion;

5.8.16.3. Activities to be started or finished in the upcoming month including, without limitation, the Contractor's workforce size and total resource hours associated with those activities;

5.8.16.4. Recommendations for adjusting the Construction Progress Schedule to meet Milestone dates and the Substantial Completion date; and

5.8.16.5. Other information requested by GDPM.

5.8.17. If it is apparent that the Contractor may be unable to meet Critical Path activities, Milestone completion dates, or the Substantial Completion date(s), GDPM shall direct the Contractor to submit within 3 days a Recovery Plan to avoid or minimize a delay in the Project.

5.8.17.1. A Recovery Plan shall include, without limitation, adjustments to one or more of the following:

- Workforce
- Hours per shift
- Shifts per workday
- Workdays per week
- Equipment
- Activity logic

5.8.17.2. If GDPM approves the Recovery Plan, the Contractor shall prepare a revised Construction Progress Schedule within 3 business days to GDPM.

- If GDPM does not approve the Recovery Plan, the Contractor shall submit within 3 days an alternate Recovery Plan to GDPM in writing for review and in accordance with the Contract Documents.

5.8.18. The Contractor shall update the Construction Progress Schedule on a monthly basis, or other interval(s) as approved by GDPM, in accordance with the Contract Documents.

5.8.18.1. The Contractor shall submit a tabular copy showing all changes to the previously approved schedule.
5.8.18.2. The original or initially approved Construction Progress Schedule and all subsequent Construction Progress Schedules submitted by the Contractor, and accepted by GDPM, shall serve as an affirmation that the Contractor agrees to meet the applicable requirements and updated Construction Progress Schedule.

5.8.18.3. The Contractor's failure to timely submit updated Construction Progress Schedules as deemed necessary by GDPM may result in withholding payments from Contractor.

5.9. Progress Meetings

5.9.1. Unless otherwise indicated in writing, GDPM shall schedule bi-weekly Progress Meetings for the Contractor and other persons involved in the Project as deemed necessary for coordination of the Work by GDPM, including Contractor's Subcontractors on the Project.

5.9.1.1. The purpose of the Progress Meeting is to review progress on the Project during the previous week, discuss anticipated progress during the following weeks, review critical operations, and discuss critical problems.

5.9.2. The Contractor shall be represented at every Progress Meeting by a person authorized with signatory authority to make decisions regarding possible modifications of the Contract Documents or Construction Progress Schedule.

5.9.2.1. GDPM shall notify the Contractor and other persons involved in the Project of the time and place of the Progress Meeting that shall thereafter be the same day and hour of the week for the duration of the Project, unless GDPM notifies the Contractor and other Persons involved in the Project of a different day and hour at least 2 days in advance.

5.9.2.2. The Contractor shall have any of its subcontractors attend the Progress Meeting as determined advisable by the Contractor, or as requested by GDPM.

5.9.2.3. Unless otherwise indicated in writing, A/E shall prepare a written report of each Progress Meeting and distribute the report to the GDPM and the Contractor.

5.9.2.4. If any person in attendance objects to anything in a report of a Progress Meeting, the person shall notify GDPM and any other affected person in writing explaining the objections within seven calendar days.

5.9.2.5. The report of each Progress Meeting shall reflect any objection made to the report of the previous Progress Meeting and any response.

5.10. Project Coordination

5.10.1. If determined needed by GDPM, the Contractor or Subcontractor(s), The Contractor shall prepare Coordination Drawings for any Coordination Area.

5.10.1.1. The Contractor shall prepare the Coordination Drawings with Computer-Aided Design ("CAD") or Building Information Modeling ("BIM") software acceptable to GDPM.

5.10.1.2. The Coordination Drawings shall show all affected work, including without limitation, plan and elevation dimensions.

5.10.2. After the Contractor completes the Coordination Drawing, the Contractor shall forward a copy of the Coordination Drawings to GDPM.

5.10.2.1. The A/E shall report any concerns in writing to the Coordination Participants within 14 days after receiving the drawings.
5.11.  **Additional Tests and Inspections**

5.11.1. If the A/E or GDPM determines that any portion of the Work requires special inspection, testing, or approval not otherwise required under the Contract Documents, the A/E and/or GDPM shall order such inspection, testing, or approval.

5.11.2. If the special inspection, testing, or approval reveals Defective Work, the Contractor shall pay all associated costs and will not be entitled to any related adjustment of the Contract Times. Those costs may include without limitation:

- The cost of special inspection, testing, or approval;
- The cost of additional special inspections, testing, or approvals, to evaluate Remedial Work;
- The cost of correcting Defective Work; and
- All related GDPM-incurred fees and charges of contractors, engineers, architects, attorneys, and other professionals.

5.11.3. GDPM may deduct the costs described under the Contract Documents from payments then or thereafter due the Contractor. If payments then or thereafter due to the Contractor are not sufficient to cover those amounts, the Contractor or its surety shall immediately pay the amount of the insufficiency to GDPM.

5.11.4. If the special inspection, testing, or approval reveals that the Work complies with the Contract Documents, and the Contractor believes that it is entitled to an adjustment of the Contract Sum or Contract Time, or both, on account of the special inspection, testing, or approval, the Contractor may file a Claim by requesting a Change Order by giving written notice within 7 days after the special inspection, testing, or approval.

5.11.5. If the Contractor is aware of the need of an inspection, testing, or approval, or of a need to have any inspection, testing, or approval completed by a particular time to avoid delay, then the Contractor shall timely communicate such information to GDPM.

5.11.6. Except as described in Additional Tests and Inspections, GDPM shall pay for any inspection, testing, or approval that did not become a requirement until after award of Contract.

5.11.7. The Contractor shall coordinate with and give GDPM reasonable notice of the anticipated dates of all inspections, testing, or approvals.

5.12.  **Review of Contract Documents**

5.12.1. Before starting each portion of the Work, the Contractor shall carefully study and compare the various Contract Documents relative to that portion of the Work, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the Site affecting it.

5.12.2. If the Contractor finds any perceived ambiguity, conflict, error, omission, or discrepancy on or between any of the Contract Documents, or between any of the Contract Documents and any Applicable Law, the Contractor, before proceeding with the Work, shall promptly submit of Requests for Information ("RFI") to GDPM for an interpretation or clarification.

5.12.2.1. Before submitting any RFI, the Contractor shall carefully review the Contract Documents to ensure that the Contract Documents do not answer the RFI.
5.12.2. If Contractor indicates that the information requested in the RFI affects the critical path of the Project's Construction Progress Schedule and attaches the portion of the Project's Construction Progress Schedule that verifies that the information requested in the RFI affects the critical path, GDPM shall make all reasonable efforts to respond to the RFI within 7 business days of receiving the RFI.

5.12.3. If the Contractor believes that it is entitled to an adjustment of the Contract Sum or Contract Times, or both, on account of clarifications or instructions issued in response to a RFI, the Contractor may submit a Claim by requesting a Change Order by giving notice within 3 business days of receiving the RFI response.

5.12.4. If Contractor does not notify GDPM in accordance with this Article Five or any other section of the Contract Documents that addresses adjustments to the Contract Sum and Contract Time, the Contractor will have accepted the RFI response without an adjustment to the Contract Sum or Contract Time and irrevocably waives his right to submit or request an adjustment to the Contract Sum and/or Contract Time.

5.12.5. Frivolous RFI

5.12.5.1. If the Contractor submits a frivolous RFI, as determined by GDPM, Contractor shall be liable to GDPM for the costs related to the review and response of the RFI.

5.12.5.1.1. GDPM may deduct the costs described herein from payments then or thereafter due to the Contractor.

5.12.5.1.2. If payments then or thereafter due to the Contractor are not sufficient to cover GDPM's costs, the Contractor or its surety shall immediately pay the amount of the insufficiency to GDPM.

5.12.5.2. Frivolous RFIs may be returned unanswered.

5.12.5.3. Delays caused by improper or frivolous RFI's are the sole responsibility of the Contractor who shall waive the Contractor's right to seek adjustments to the Contract Sum and Contract Time.

5.13. Site Investigation and Conditions Affecting the Work

5.13.1. The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and location of the work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including, but not limited to:

- Conditions bearing upon transportation, disposal, handling, and storage of materials;
- The availability of labor, water, electric power and roads;
- Uncertainties of weather, river stages, tides, or similar physical conditions at the site;
- The conformation and conditions of the ground; and
- The character of equipment and facilities needed preliminary to and during work performance.

5.13.2. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by GDPM, as well as from the drawings and specifications made part of this contract.
5.13.2.1. Any failure of the Contractor Site Investigation and Conditions Affecting the Work will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the Work, or for proceedings to successfully perform the Work without additional expense to GDPM.

5.13.3. GDPM assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by GDPM. Nor does GDPM assume responsibility for any understanding reached or representations made concerning conditions which can affect the Work by any of its officers or agents before execution of this Contract, unless that understanding or representation is expressly stated in this Contract.

5.14. **Protection of the Project**

5.14.1. The Contractor shall protect the Project from weather and maintain the Work and all materials, apparatus, and fixtures free from injury or damage until Substantial Completion of the Work.

5.14.1.1. The Contractor shall at all times cover or protect the Work and materials.

5.14.1.2. The Contractor, at its own expense, shall remove, and replace with new, any Work damaged as a result of the Contractor's failure to provide coverage or protection.

5.14.1.3. After the date of Substantial Completion of the Work, GDPM is responsible for protecting and maintaining all materials, apparatus, and fixtures for the occupied portion of the Project from injury or damage.

5.14.2. The Contractor shall protect the Project and existing or adjacent property from damage at all times and shall erect and maintain necessary barriers, lateral support, furnish and keep lighted necessary danger signals at night, and take reasonable precautions to prevent injury or damage to individuals or property.

5.14.3. **Temporary Heating**

5.14.3.1. The Contractor shall provide and pay for temporary heating, covering, and enclosures necessary to protect all Work and materials against damage by dampness and cold, to dry out the Work, and to facilitate the completion of Work.

5.14.3.2. Any permanent heating equipment used shall be turned over to GDPM in the condition and at the time required by the specifications.

5.14.4. The Contractor shall not load, or permit any part of the Project to be loaded, in any manner that endangers the Project, or any proportion thereof.

5.14.4.1. The Contractor shall not subject any part of the Project or existing or adjacent property to stress or pressure that endangers the Project or property.

5.14.5. **Protection of Existing Vegetation, Structures, Equipment, Utilities, and Improvements**

5.14.5.1. The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work sites, which are not to be removed under this Contract, and which do not unreasonably interfere with the Work required under this Contract.

5.14.5.2. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place.
5.14.5.2.1. If any limbs or branches of trees are broken during performance of this Contract, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as specifically directed by GDPM.

5.14.5.3. The Contractor shall protect from damage all existing improvements and utilities (1) at or near the work site and (2) on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor.

5.14.5.3.1. Prior to disturbing the ground at the construction site, the Contractor shall ensure that all underground utility lines are clearly marked.

5.14.5.4. The Contractor shall shore up, brace, underpin, secure, and protect as necessary all foundations and other parts of existing structures adjacent to, adjoining, and in the vicinity of the site, which may be affected by the excavations or other operations connected with the construction of the Project.

5.14.5.5. Any equipment temporarily removed as a result of work under this Contract shall be protected, cleaned, and replaced in the same condition as at the time of award of this Contract.

5.14.5.6. New work which connects to existing Work shall correspond in all respects with that to which it connects and/or be similar to existing Work unless otherwise required by the specifications.

5.14.5.7. No structural members shall be altered or in any way weakened without the written authorization of GDPM, unless such work is clearly specified in the Plans or specifications.

5.14.5.8. If the removal of the existing Work exposes discolored or unfinished surfaces, or work out of alignment, such surfaces shall be refinished, or the material replaced as necessary to make the continuous work uniform and harmonious.

• This, however, shall not be construed to require the refinishing or reconstruction of dissimilar finishes previously exposed, or finished surfaces in good condition, but in different plans or on different levels when brought together by the removal of intervening work, unless such refinishing or reconstruction is specified in the plans or specifications.

5.14.5.9. The Contractor shall give all required notices to any adjoining or adjacent property owner or other party before commencement of any Work.

5.14.5.10. The Contractor shall indemnify and save harmless GDPM from any damages on account of settlement or the loss of lateral support of adjoining property, any damages from changes in topography affecting drainage, and from all loss or expense and all damages for which GDPM may become liable in consequence of such injury or damage to adjoining and adjacent structures and their premises.

5.14.5.11. The Contractor shall repair any damage to vegetation, structures, equipment, utilities, or improvements, including those that are the property of a third party, resulting from failure to comply with the requirements of this Contract or failure to exercise reasonable care in performing the work.

• If the Contractor fails or refuses to repair the damage promptly, GDPM may have the necessary Work performed and charge the cost to the Contractor.
5.14.6. Vibration, Noise, and Dust Control

5.14.6.1. The Contractor shall provide controls/barriers for vibrations, noise, and dust control in occupied buildings as required by the construction operations.

5.14.6.2. The Contractor will not be permitted to exhaust or release unfiltered air, dust, construction debris, or other undesirable products into the exterior atmosphere or into occupied areas of the building.

5.14.6.2.1. GDPM may limit or stop the Work if the Contractor does not maintain proper air-quality standards.

5.14.6.2.2. Such stoppage may result in a charge to the Contractor.

5.14.6.3. In certain occupied buildings, tasks might be of such a nature that noise and vibration cannot be tolerated.

- In such spaces and as approved by GDPM, Work may be scheduled for other than normal working hours.
- The Contractor is cautioned that weekend or overtime work, if required, shall be performed at no additional cost.
- Permission to work other than standard hours shall be received from GDPM prior to the occurrence.
- Weekend or overtime Work shall be reflected in the Construction Progress Schedule.

5.14.6.4. The Contractor is responsible for vibration control and control of transmission of noise arising from the Work.

5.14.6.5. Principal considerations that shall be given to noise and vibrations control are:

- Noise control in compliance with Occupational Safety and Health Administration (OSHA) shall be for all areas of the facility, including equipment rooms, boiler rooms, and fan rooms.
- Vibration control to limit sound produced by construction equipment, and for protection of the equipment existing in the building and the building structure.
- Vibration control to provide for the maximum usefulness of the facility by keeping levels of vibration within ranges conducive to peaceful enjoyment of residential living or work or other uses for which the facility was designed.

5.15. General Warranty - Materials, Equipment and Workmanship

5.15.1. The Contractor warrants to GDPM and A/E that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise.

5.15.1.1. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit.

5.15.1.2. Work, materials, or equipment not conforming to these requirements may be considered defective.

5.15.1.3. If required by the A/E, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.
5.15.2. If the Contractor breaches any of its obligations, the Contractor will pay the Owner for its damages and expenses, including but not limited to attorneys' and consultants' fees and expenses, arising out of or related to such breach.

5.15.2.1. The Contractor's obligation shall be joint and several.

5.15.3. Additional Warranties

5.15.3.1. The Contractor gives the Owner the following additional warranties:

5.15.3.1.1. If the Contractor's Work includes all or part of the exterior roofing system, provided that the Architect has designed the roofing system to be weather tight, the Contractor warrants that the roofing system will be weather tight; and

5.15.3.1.2. If the Contractor's Work includes all or part of the exterior wall system, provided that the Architect has designed the wall system to be weather tight, the Contractor warrants that the wall system will be weather tight. Weather tight shall mean the roofing and/or wall system does not permit any infiltration of water in any form that would have any adverse effect on GDPM's operations or the Project.

5.15.4. The Contractor shall, at the time of final completion of the Work and as a condition precedent to final payment to Contractor, assign to GDPM all manufacturer's warranties related to the materials and labor used in the Work and further agrees to perform the Work in such manner as to preserve any and all such manufacturer's warranties and deliver to the A/E the warranties, project manual, operating procedures, and other materials related to each of the building systems and materials included in the Contractor's Work and as required by the Specifications.

5.15.5. Upon notice of the breach of any of the warranties or guarantees identified herein, or any other warranties or guarantees under the Contract Documents, the Contractor, in addition to any other requirements in the Contract Documents, shall commence to correct such breach and all damage resulting therefrom within two (2) business days from written notice thereof, thereafter use its best efforts to correct such breach and damage to the satisfaction of GDPM and A/E, and, except when an extension of time is granted in writing by GDPM, correct such breach and damage to the satisfaction of GDPM within thirty (30) calendar days of such notice, or such other time as provided in the notice; provided, however, that if such notice is given after final payment the 2-day period shall be extended to seven (7) calendar days.

5.15.5.1. If the Contractor fails to commence to correct such breach and damage, or to correct such breach or damage as provided above, GDPM, without prejudice to any of its other rights or remedies at law or under the Contract Documents, may correct the breach without further notice to Contractor.

5.15.5.2. The Contractor shall pay GDPM's reasonable costs and expenses incurred in connection with the or related to such correction and/or breach, including without limitation GDPM's administrative, legal, and consulting expenses and additional service fees of the A/E.

5.15.5.3. The foregoing warranties and obligations of the Contractor shall survive final payment and/or termination of the Contract and shall not be limited by any other terms contained in the Contract Documents.
5.15.5.4. If the Contractor fails to pay the GDPM any amounts due hereunder, the Contractor shall pay the GDPM, in addition to the amounts due, a late payment fee of one and one-half percent (1.5%) per month for each month or part thereof that the payments are not paid when due.

5.15.6. Contractor shall bring to or store at the Site only the materials and equipment required for the Work. If possible, materials and equipment should be installed in their final positions when brought to the Site.

5.15.7. All equipment, material, and articles furnished under this Contract shall be of the most suitable grade for the purpose intended, unless otherwise specifically provided in this Contract.

5.15.7.1. References in the Contract to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition.

5.15.7.2. The Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of, and as approved by GDPM in writing, is equal to that named in the specifications, unless otherwise specifically provided in this Contract so long as Contractor has submitted a substitution request to GDPM.

5.15.7.3. If the substituted material has not been approved by GDPM in writing, the substituted material may be considered Defective Work by GDPM or A/E.

5.15.8. Approval of Equipment and materials

5.15.8.1. The Contractor shall obtain GDPM's approval of the machinery and mechanical and other equipment to be incorporated into the work.

I. When requesting approval, the Contractor shall furnish to GDPM the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the machinery and mechanical and other equipment.

II. When required by this contract or by GDPM, the Contractor shall also obtain GDPM's approval of the material or articles which the Contractor contemplates incorporating into the work.

III. When requesting approval, the Contractor shall provide full information concerning the material or articles.

IV. Machinery, equipment, material, and articles that do not have the required approval shall be installed or used at the risk of subsequent rejection.

5.15.8.2. When required by the specifications or GDPM, the Contractor shall submit appropriately marked samples (and certificates related to them) for approval at the Contractor's expense, with all shipping charges prepaid.

- The Contractor shall label, or otherwise properly mark on the container, the material or product represented, its place of origin, the name of the producer, the Contractor's name, and the identification of the construction project for which the material or product is intended to be used.

5.15.8.3. Certificates shall be submitted electronically in triplicate, describing each sample submitted for approval and certifying that the material, equipment or accessory complies with contract requirements. The certificates shall include the name and brand of the product, name of manufacturer, and the location where produced.
5.15.8.4. Approval of a sample shall not constitute a waiver of GDPM's right to demand full compliance with contract requirements.

- Materials, equipment and accessories may be rejected for cause even though samples have been approved.

5.15.8.5. Wherever materials are required to comply with recognized standards or specifications, such specifications shall be accepted as establishing the technical qualities and testing methods, but shall not govern the number of tests required to be made nor modify other Contract requirements.

- GDPM may require laboratory test reports on items submitted for approval or may approve materials on the basis of data submitted in certificates with samples.

- Check tests will be made on materials delivered for use only as frequently as GDPM determines necessary to insure compliance of materials with the specifications.

- The Contractor will assume all costs of retesting materials which fail to meet contract requirements and/or testing materials offered in substitution for those found deficient.

5.15.8.6. After approval, samples will be kept in the Project office until completion of work. They may be built into the work after a substantial quantity of the materials they represent has been built in and accepted.

5.15.9. Requirements concerning lead-based paint: The Contractor shall comply with the requirements concerning lead-based paint contained in the Lead-Based Paint Poisoning Prevention Act.

5.15.10. Substitutions

5.15.10.1. If the Contractor provides approved Substitutions that require changes to the Contract Documents, the Contractor shall be solely responsible for the additional costs incurred as a result, including without limitation changes to the design by the A/E.

5.15.10.2. GDPM shall consider Requests for Substitutions after the bid opening only when the Contractor can conclusively demonstrate to GDPM the following conditions:

I. The specified Basis of Design Components, Acceptable Components, or previously approved Substitutions through no fault of the Contractor are not available; or

II. The specified Basis of Design Components, Acceptable Components, or previously approved Substitutions will not perform as designed or intended.

5.15.10.3. The Contractor's incorporation of unapproved Substitutions in the Work shall constitute Defective Work.

5.15.10.4. If the Contractor provides an unacceptable Component, the Contractor shall be solely responsible for the costs of coordination and modification required.

5.16. Specifications and Drawings for Construction

5.16.1. The Contractor shall keep on the work site a stamped, permit set of the drawings and specifications and shall at all times give GDPM access thereto.
5.16.1.1. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both.

5.16.1.2. In case of difference between drawings and specifications, the specifications shall govern.

5.16.1.3. In case of a discrepancy in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to GDPM, who shall promptly make a determination in writing.

5.16.1.4. Any adjustment by the Contractor without such determination shall be at its own risk and expenses.

5.16.1.5. GDPM shall furnish from time to time such detailed drawings and other information as considered necessary, unless otherwise provided.

5.16.2. Wherever in the specifications or upon the drawings the words "directed", "required", "ordered", "designated", "prescribed", or words of like import are used, it shall be understood that the "direction", "requirement", "order", "designation", or "prescription", of GDPM is intended.

5.16.3. Where "shown," indicated", "detailed", or words of similar import are used, it shall be understood that the reference is made to the drawings accompanying this Contract unless otherwise stated, the word "provided" as used herein shall be understood to mean "provide complete in one place" that is "furnished and installed".

5.16.4. "Shop Drawings" means drawings, submitted to GDPM by the Contractor, subcontractor or any lower tier subcontractor, showing in detail, 1) the proposed fabrication and assembly of structural elements and 2) the installations (i.e., form, fit, and attachment details) of materials of equipment.

5.16.4.1. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the Contractor to explain in detail specific portions of the work required by the Contract.

5.16.4.2. GDPM may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

5.16.5. If this Contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with other Contract requirements and shall indicate its approval thereon as evidence of such coordination and review.

5.16.5.1. Shop Drawings submitted to the A/E without evidence of the Contractor's approval may be returned for resubmission.

5.16.5.2. GDPM will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate GDPM's reasons therefore.

5.16.5.3. Any Work done before such approval shall be at the Contractor's risk.

5.16.5.4. Approval by the A/E shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this Contract, except with respect to approved variations.

5.16.6. If shop drawings show variations from the Contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission.
5.16.6.1. If the A/E approves any such variation and GDPM concurs, GDPM shall issue an appropriate modification to the Contract, except that, if the variation is minor or does not involve a change in price or in time of performance, a modification need not be issued.

5.16.7. It shall be the responsibility of the Contractor to make timely requests to GDPM for such large scale and full size drawings, color schemes, and other additional information, not already in possession, which shall be required in the planning and production of the work.

5.16.7.1. Such requests may be submitted as the need arises, but each such request shall be filed with ample time to permit appropriate action to be taken by all parties involved so as to avoid delay.

5.16.8. The Contractor shall electronically submit to GDPM for approval (unless otherwise indicated) all shop drawings as called for under the various headings of the specifications.

5.16.8.1. As required by GDPM, the Contractor, upon completing the work under this Contract, shall furnish a complete set of drawings as finally approved.

5.16.8.2. These drawings show all changes and revisions made up to the time the work is completed and accepted.

5.16.9. Specifications and Drawings for Construction shall be included in all subcontracts at any tier.

5.16.9.1. It shall be the responsibility of the Contractor to ensure that all shop drawings prepared by subcontractors are submitted to GDPM.

5.17. As Built Drawings

5.17.1. "As-built drawings," means drawings submitted by the Contractor or subcontractor at any tier to show the construction of a particular structure or Work as actually completed under the Contract.

5.17.1.1. "As-built drawings" shall be synonymous with "Record Drawings".

5.17.2. As required by GDPM, the Contractor shall provide GDPM accurate information to be used in the preparation of permanent as-built drawings.

5.17.2.1. For this purpose, the Contractor shall record on one set of contract drawings all changes from the installations originally indicated, and record final locations of underground lines by depth from finish grade and by accurate horizontal offset distances to permanent surface improvements such as buildings, curbs, or edges of walks.

5.17.3. As Built Drawings shall be included in all subcontracts at any tier.

5.17.4. It shall be the responsibility of the Contractor to ensure that all As-Built Drawings prepared by subcontractors are submitted to GDPM.

5.18. Project Document Maintenance and Submittal

5.18.1. During Construction

5.18.1.1. The Contractor shall maintain in good order at a secure location on the Site:

I. A complete copy of all Contract Documents; Shop Drawings, Product Data, samples and similar required submittals; manufacturer operating and maintenance instructions; certificates; warranties; RFIs and responses thereto; and other Project-related documents, all marked currently and accurately to record field changes and selections made during construction and to show
actual installation where installation varies from Work as originally shown, including the exact location and depth of underground utility lines; and

II. A set of Drawings as approved by any applicable jurisdiction and Specifications.

5.18.1.2. Before submitting each Contract Payment Request, the Contractor shall record all changes on the Contract Documents, neatly in a contrasting color, noting new information not shown on the original Contract Documents.

- Failure to record all changes may cause payment to be withheld or delayed by GDPM.

5.18.1.3. The Contractor shall keep a record of changes made to the Specifications, noting particularly any approved variation from manufacturer's installation instructions and recommendations.

5.18.1.4. If the Contractor uses Shop Drawings to indicate as-built conditions, the Contractor shall cross-reference the Shop Drawing sheet numbers to the corresponding sheet numbers on the Contract Documents.

- The Contractor shall note related numbers where applicable.

5.18.2. Before Contract Completion

5.18.2.1. The Contractor, as a condition precedent to execution of the Certificate of Contract Completion and final payment, shall organize the As-Built Documents into manageable sets, bind the sets with durable paper cover sheets, and deliver the As-Built Documents to GDPM.

5.18.2.2. When applicable, The Contractor's As-Built Documents submission shall include, but is not limited to:

I. Certificate of Occupancy;

II. Inspection certificates for pressure piping, elevator, boiler, electrical, plumbing or piping purification, etc.

III. Letter of Approval from the local fire authority or State Fire Marshal for the fire suppression system;

IV. Operation and Maintenance Manuals, organized into suitable sets of manageable size;

V. Indexed data bound in individual binders, with pocket folders for folded sheet information and appropriate identification marked on the front and the spine of each binder;

VI. Neatly and accurately marked sets of As-Built Documents, and other Contract Documents reflecting the actual construction of the Project;

VII. Detailed Drawings reflecting the exact location of any concealed utilities, mechanical or electrical systems, and components;

VIII. Assignment to GDPM of all warranties and guarantees, including the most-recent address and telephone number of any Subcontractors or manufacturers;

IX. An affidavit to certify that all Subcontractors have been paid in full for all Work performed or materials furnished for the Project;

X. Final certified payroll reports; and
XI. An affidavit to certify that the Contractor and each of its Subcontractors, regardless of tier, have complied with all requirements of HUD and the Ohio Revised Code.

5.18.2.3. By submitting the As-Built Documents to GDPM, the Contractor certifies that its As-Built Documents are complete, correct, and accurate.

5.19. Temporary Buildings and Transportation of Materials

5.19.1. Temporary buildings (e.g., storage sheds, shops, offices, sanitary facilities) and utilities may be erected by the Contractor only with the approval of GDPM and shall be built with labor and materials furnished by the Contractor without expense to GDPM.

5.19.1.1. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work.

5.19.1.2. With the written consent of GDPM, the buildings and utilities may be abandoned and need not be removed.

5.19.2. The Contractor shall, as directed by GDPM, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by GDPM.

5.19.2.1. When materials are transported in prosecuting the Work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any federal, state, or local law or regulation.

5.19.2.2. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage.

5.19.2.3. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

5.20. Facilities

5.20.1. The Contractor shall provide and maintain in a clean condition:

5.20.1.1. Suitable facilities, including temporary facilities, equipment, services, and enclosed storage for its use at the Site;

5.20.1.2. Adequate space, equipment, and furnishings to conduct progress meetings, and store approved documents and permits;

5.20.1.3. Adequate sanitary facilities for use by all Persons at the Site.

5.21. Progress Cleaning

5.21.1. The Contractor shall remove all waste materials, rubbish, and mud attributable to the Work in accordance with the Specifications, if applicable, and to an appropriate disposal location.

5.21.2. The Contractor shall perform weekly broom cleaning of hard flooring surfaces in the area of the Work.

5.21.3. The Contractor shall remove, at the end of each working day or more frequently, as appropriate, for the Project, all waste materials and rubbish from the disposal location.

5.21.4. The Contractor shall remove, as appropriate for the Project or as the A/E or GDPM directs, any waste materials or rubbish from areas adjacent to the Project.
5.21.5. The Contractor shall dispose of waste materials, rubbish, and construction debris in a lawful manner in approved recycling facilities or landfills and record of such disposal shall be available upon written request of GDPM.

5.21.6. If the Contractor fails to clean up during the progress of the Work, GDPM may clean up on behalf of the Contractor and at the Contractor's expense.

5.21.6.1. If the Contractor fails to maintain the areas adjacent to the Project clean and free of waste materials and rubbish, GDPM may also direct the local jurisdiction responsible for the area to have the area cleaned to its satisfaction at the Contractor's expense.

5.21.6.2. GDPM may deduct the cleaning costs from payments then or thereafter due the Contractor.

- If payments then or thereafter due the Contractor are not sufficient to cover those amounts, the Contractor shall immediately pay the amount of the insufficiency to GDPM.

5.21.7. The Contractor shall remove excavated material and spoil to a suitable off-site location approved by GDPM.

5.21.7.1. If GDPM designates a location on its property for disposal or storage of clean topsoil and/or subsoil in the Contract Documents, the Contractor shall remove such materials to the designated location.

5.22. Use of Premises

5.22.1. The Contractor shall use corridors, stairs, and elevators as designated by GDPM and only during those times that are designated by GDPM.

5.22.2. The Contractor shall exercise extreme care to not exceed the carrying capacity of elevators or damage the cab interior, including but not limited to damaging the cab padding, in any way.

5.22.3. Loitering or wandering through interior of buildings or exterior grounds outside the limits of the Work will not be permitted.

5.22.4. The Contractor shall confine its apparatus, materials, and the operations of its workers to the limits indicated by law, ordinances, permits and the directions of GDPM.

5.22.5. Unless expressly required or approved by GDPM, no signs or advertising of any kind will be permitted on or about the Site, except those appearing on trucks and trailers.

5.22.6. GDPM may deduct the costs associated with remedying Contractor's misuse of the premises from payments then or thereafter due the Contractor.

- If payments then or thereafter due the Contractor are not sufficient to cover those amounts, the Contractor shall immediately pay the amount of the insufficiency to GDPM.

5.23. GDPM Use of Premises / Possession Prior to Completion

5.23.1. GDPM shall have the right to take possession of or use any completed or partially completed part of the Work.

1. Before taking possession of or using any Work, GDPM shall furnish the Contractor a list of items of Work remaining to be performed or corrected on those portions of the Work that GDPM intends to take possession of or use.
II. However, failure of GDPM to list any item of work shall not relieve the Contractor of responsibility for complying with the terms of the Contract.

III. GDPM’s possession or use shall not be deemed acceptance of Work under the Contract.

5.23.2. While GDPM has such possession or use, the Contractor shall be relieved of the responsibility for:

I. The loss of or damage to the Work resulting from GDPM’s possession or use, notwithstanding the terms herein;

II. All maintenance costs on the areas occupied; and

III. Furnishing heat, light, power, and water used in the areas occupied without proper remuneration therefore.

5.23.3. If timely requested by the Contractor and if prior possession or use by GDPM delays the progress of the Work or causes additional expense to the Contractor, an equitable adjustment shall be made in the contract price or the time of completion, and the Contract shall be modified in writing accordingly.

5.24. Smoking and Tobacco Products

5.24.1. Smoking is not permitted at any property under construction, unless GDPM has a specifically designated area for smoking, and is not permitted within 50 feet of any entrance of a GDPM owned building.

5.24.2. This prohibition applies to new construction and rehabilitation.

5.24.3. The Contractor shall enforce these restrictions on any individual employed by the Contractor, or a Subcontractor.

5.24.4. A violation of GDPM’s Non-Smoking Policy may result in a fee for damages to be made payable by Contractor to GDPM in the amount of $250 per incident per day. Parties acknowledge and agree that this fee for damages is a reasonable amount to provide for the violation of the Non-Smoking Policy and is not necessarily putative in nature, but covers the actual reasonable cost to remedy such breach.

5.24.5. GDPM may deduct the costs associated with Contractor’s breach of GDPM’s Non-Smoking Policy from payments then or thereafter due the Contractor.

• If payments then or thereafter due the Contractor are not sufficient to cover those amounts, the Contractor shall immediately pay the amount of the insufficiency to GDPM.

5.25. Correction of the Work

5.25.1. Before Substantial Completion

5.25.1.1. If the Contractor provides Defective Work or fails or neglects to perform the Work in accordance with the Construction Progress Schedule, GDPM or the A/E may issue a written notice to the Contractor and Contractor’s Surety directing the Contractor to correct the Defective Work or recover schedule deficiencies.

• Unless otherwise specified in that written notice, the Contractor shall begin to correct the Defective Work and recover the schedule deficiencies within no more than three days after GDPM issues the written notice.
5.25.1.2. If the Contractor fails to commence and diligently pursue correction of Defective Work or recovery of schedule deficiencies within three (3) business days of Contractor's receipt of written notice from GDPM or the A/E, GDPM may correct the Defective Work or take action to recover schedule deficiencies without giving further notice to the Contractor or Contractor's Surety.

5.25.2. During the Correction Period

5.25.2.1. If GDPM issues a notice during the Correction Period, GDPM may correct the Defective Work itself without giving further notice to the Contractor or Contractor's Surety if the Contractor fails to:

   a. Notify GDPM in writing of the Contractor's intent to correct the Defective Work within 3 days after GDPM issues the notice; and
   
   b. Thereafter promptly commence and diligently pursue correction of Defective Work.

5.25.2.2. The Correction Period:

   a. Commences on the date of issuance of the written notice of Defective Work to Contractor and/or Contractor's surety and expires upon the date indicated in said written notice;
   
   b. Relates only to the Contractor's specific obligation and opportunity to correct the Work during the Correction Period;
   
   c. Does not establish a period of limitation with respect to any of the Contractor's other obligations under the Contract Documents;
   
   d. Has no relationship to the time within which GDPM may seek to enforce the Contract; and
   
   e. Does not establish a period of limitation with respect to the commencement of litigation to establish the Contractor's liability under the Contract or otherwise.

5.25.3. After the Correction Period:

5.25.3.1. GDPM may correct, at the Contractor's expense, the Defective Work without giving further notice to the Contractor or Contractor's Surety if the Contractor or Contractor's surety fails to

   a. Notify GDPM in writing of the intent to correct the Defective Work; and
   
   b. Promptly commence and diligently pursue correction of Defective Work.

5.25.4. After Substantial Completion

5.25.4.1. In addition to the Contractor's other obligations under the Contract Documents, if any of the Work is found to be Defective Work after Substantial Completion, the Contractor shall correct it promptly after receipt of written notice from GDPM to do so, unless GDPM has previously acknowledged and accepted the Defective Work in writing.

5.25.4.2. GDPM may send a copy of the written notice to the Contractor's Surety, but is not obligated to do so.

5.25.5. Emergency Correction of Defective Work
5.25.5.1. Notwithstanding any other provision of the Contract, if in GDPM’s opinion the Defective Work presents a threat of imminent harm or danger to people, property, or the environment, GDPM may order the Contractor to immediately correct Defective Work or GDPM may correct the Defective Work, at Contractor's expense, itself without any prior notice to the Contractor or Contractor’s Surety.

5.25.6. Responsibility for Costs of Correction

5.25.6.1. The Contractor shall pay all of the costs and damages associated with the correction of Defective Work and the recovery of schedule deficiencies.

5.25.6.2. Those costs and damages may include, but are not limited to:

- The related fees and charges of contractors, engineers, architects, attorneys, and other professionals; and
- The cost of correcting or replacing adjacent work.

5.25.6.3. GDPM may deduct those costs and damages from payments then or thereafter due the Contractor.

5.25.6.3.1. If payments then or thereafter due the Contractor are not sufficient to cover those amounts, the Contractor shall immediately pay the amount of the insufficiency to GDPM.

6. ARTICLE VI: SUBCONTRACTORS

6.1. Definitions: As used in this Contract:

6.1.1. "Subcontract" means any contract, purchase order, or other purchase agreement, including modifications and change orders to the foregoing, entered into by a subcontractor to furnish supplies, materials, equipment, and services for the performance of the prime contract or a subcontract.

6.1.2. "Subcontractor" means any supplier, vendor, or firm that furnished supplies, materials, equipment, or services to or for the Contractor or another subcontractor.

6.2. Evaluation and Approval

6.2.1. When submitting its Bid, the Contractor shall submit a Subcontractor and Material Supplier Declaration Form through which the Contractor identifies its Subcontractor and provide a list of subcontractors and material suppliers and equipment with bid.

6.2.2. Within 10 days after the Notice to Proceed, the Contractor shall submit to GDPM, an updated Subcontractor and Material Supplier Declaration form.

6.2.3. In its discretion, GDPM will evaluate the use of proposed subcontractors. If GDPM rejects any proposed Subcontractor, the Contractor shall propose a replacement Subcontractor with no adjustment of the Contract Sum. The proposed replacement will also be evaluated.

6.2.4. If requested by GDPM, Contractor must supply additional information on use of proposed subcontractor within five business days of such request. The Contractor's failure to timely submit the information regarding a proposed Subcontractor may result in withholding payment to Contractor.
6.3. Suspension/Debarment

6.3.1. The Contractor shall not enter into any subcontract with any subcontractor who has been denied participation by GDPM or has been temporarily or permanently denied participation in a HUD program or who has been suspended or debarred from participating in contracting programs by any agency of the United States Government or the State of Ohio.

6.4. Contractor's Responsibility

6.4.1. The Contractor shall be as fully responsible for the acts or omissions of its Subcontractors and of persons either directly or indirectly employed by them as for the acts or omissions of persons directly employed by the Contractor.

6.4.2. Contractor is responsible for scheduling and coordinating the Work of the Subcontractors.

6.4.3. The Contractor is fully responsible for any delay, interference, disruption, or hindrance attributable to the Contractor's Subcontractors.

6.4.4. The Contractors shall require that each of its Subcontractors have a competent supervisor at the Site whenever the Subcontractor is performing Work.

6.4.5. The Contractor shall use GDPM's form of Subcontract for each of its subcontractors and material suppliers. Contractor shall not agree to any provision, which seeks to bind GDPM, or with terms inconsistent with or at variance from these Contract Documents.

6.4.6. The Contractor will not be relieved of its full responsibility for Subcontractors and their performance of the Work by:

6.4.6.1. The participation of GDPM, HUD, or the A/E in the processes described under this ARTICLE VI SUBCONTRACTORS or other related provisions of the Contract Documents; or

6.4.6.2. GDPM's rejection of a Subcontractor or failure to reject a Subcontractor.

6.5. Mandatory Contract Provisions/Forms

6.5.1. The Contractor shall insert appropriate clauses in all subcontracts to bind Subcontractors to the terms and conditions of this Contract insofar as they are applicable in the work of Subcontractors.

6.5.2. GDPM reserves the right to reassign accepted agreements

6.5.3. Nothing contained in the Contract Documents shall create any contractual relationship between any subcontractor and GDPM or between the Subcontractor and HUD.

6.5.4. The Contractor must include in the contract with its Subcontractors the applicable labor provisions and prevailing wages as was provided to the Contractor by GDPM.

6.5.5. No less than 10 days before the Work is to be performed by a Subcontractor, or within a shorter period as mutually agreed by the Contractor and GDPM, the Contractor shall submit to GDPM a complete copy of the executed Subcontract between the Contractor and Subcontractor.

6.6. Replacement of Subcontractors

6.6.1. The Contractor shall not replace any Subcontractor after execution of the Subcontract without prior written approval of GDPM.

6.6.2. The Contractor shall not add any subcontractors after the Contract Execution without
6.7. **Contingent Assignment of Subcontract**

6.7.1. The Contractor hereby assigns its Agreement with each Subcontractor to GDPM provided that the assignment is effective only after termination of the Contract by GDPM and only for those agreements that GDPM accepts by notifying Contractor and applicable Subcontractor in writing.

6.8. **Prompt Payment of Subcontracts**

6.8.1. The Contractor shall make payments to the Subcontractor in accordance with Applicable Law, including the Ohio Revised Code that include, without limitation, the requirements under this Section, 6.8 - Prompt Payment of Subcontracts.

6.8.2. If a Subcontractor requests payment in time to allow the Contractor to include the request in its Contractor Payment Application Request the Contractor, within ten calendar days after receipt of payment from GDPM, shall pay to the:

6.8.2.1. Subcontractor, an amount equal to the percentage of completion of the subcontractors contract allowed by GDPM for the amount of labor or work performed;

6.8.2.2. Material Supplier, an amount that is equal to all or a portion of the invoice for materials which represents the materials furnished by the material supplier

6.8.3. The Contractor may reduce the amount paid by any retainage provision contained in the Contract, invoice, or purchase order between the Contractor and Subcontractor and may withhold amounts that may be necessary to:

6.8.3.1. Resolve disputed liens or claims involving the Work or labor performed by the Subcontractor; or

6.8.3.2. Account for failure of the Subcontractor to perform its obligations under its agreement with the Contractor as required under the Ohio Revised Code.

6.8.4. **Labor Payments**: Within ten days of receipt of payment from GDPM, the Contractor shall pay Subcontractor in the following manner:

6.8.4.1. Partial payments to the Subcontractor for labor performed under either a Unit Price or lump sum Subcontract shall be made at the rate of 92 percent of the amount invoiced through the Subcontractor's request for payment that shows the Work of the Subcontractor is up to 50% complete.

6.8.4.2. After the Work of the Subcontractor is 50 percent complete, as evidenced by payments of at least 50 percent of the total amount due under the Subcontract, no additional funds shall be retained from payments for labor.

6.8.5. **Material Payment**

6.8.5.1. Required by ORC for payment to Contractor by GDPM:

- The Contractor shall pay the Subcontractor at the rate of 95% of the invoice cost, not to exceed the scheduled value in a unit price or lump sum Subcontract, for materials delivered to the Site, or other offsite storage location approved by GDPM, provided the Subcontractor provides the information required with its request for payment.

- The Contractor shall pay the Subcontractor at the rate of 100% of the scheduled
value for materials incorporated into the Project.

6.8.6. If Contractor fails to comply with the payment provisions set forth, the Contractor shall pay to the applicable Subcontractor, in addition to any payment due, interest in the amount of 18 percent per annum of the payment due, beginning the eleventh day following the receipt of payment from GDPM and ending on the date of full payment of the payment due plus interest.

6.8.7. If GDPM receives a Claim Affidavit from a Subcontractor, Subcontractor shall proceed in accordance with Applicable Law, including the Ohio Revised Code.

6.8.8. Laborers, Subcontractors, and Material Suppliers may secure payment rights in accordance with Applicable Law, including the Ohio Revised Code.

6.9. Subcontracting To Meet Diversity & Contracting Goals

6.9.1. The Contractor shall take the following steps to ensure that, whenever possible, Subcontracts are awarded to small business firms, minority firms, women's business enterprises, and labor surplus area firms:

6.9.1.1. Place qualified small and minority businesses and women's business enterprises on solicitations lists;

6.9.1.2. Ensure that small and minority businesses and women's business enterprises are solicited whenever they are potential resources

6.9.1.3. Divide total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by small and minority businesses and women's business enterprises;

6.9.1.4. Establish a delivery schedule, where the requirements of the Contract permit, which encourages participation by small and minority businesses and women's business enterprises; and

6.9.1.5. Use the services and assistance of the U.S. Small Business Administration, the Minority Business Development Agency of the U.S. Department of Commerce, and State and local governmental small business agencies.

7. ARTICLE VII: SUBCONTRACTORS

7.1. GDPM Obligation

7.1.1. GDPM shall pay the Contractor the price as provided in the Contract.

7.2. Forms

7.2.1. Unless expressly authorized to the contrary, Contractor must use appropriate GDPM forms.

7.3. Step One - Pencil Application

7.3.1. The purpose of a pencil application (HUD Form) is assisting the Contractor in identifying any potential error or omission in the pay application.

7.3.2. If submitted timely (as set forth below) GDPM will review and help identify any potential issues. However, the GDPM Construction Administrator's approval or suggestion does not guarantee approval of the payment application by GDPM.

7.3.3. The Contractor shall initially submit a pencil application by no later than the 15th of each month.
7.3.4. Generally, the GDPM Construction Administrator will review the pencil application, and make any suggested corrections and return to the Contractor within a reasonable amount of time.

7.3.5. The Contractor shall then submit the final payment application to the GDPM Construction Administrator or project manager by the 23rd of each month.

7.3.6. Failure to submit a pencil application may result in a significant delay in payment.

7.4. Progress Payments

7.4.1.1. GDPM shall make progress payments approximately every 30 days as the work proceeds on estimates of Work accomplished which meets the standards of quality established under the Contract, as approved by GDPM.

7.4.1.2. Subject to GDPM’s written determination and approval more frequent payments may be made to contractors which are qualified as small businesses.

7.4.2. Before the first progress payment under this contract, the Contractor shall furnish, in such detail as requested by GDPM, a breakdown of the total contract price showing the amount included therein for each principal category of the work, which shall substantiate the payment amount requested in order to provide a basis for determining progress payments.

- The breakdown shall be approved by GDPM and must be acceptable to HUD.
- If the contract covers more than one Project, the Contractor shall furnish a separate breakdown for each.
- The values and quantities employed in making up this breakdown are for determining the amount of progress payments and shall not be construed as a basis for additions to or deductions from the contract price.
- The Contractor shall prorate its overhead and profit over the construction period of the contract.

7.4.3. The Contractor shall submit, on forms provided by GDPM, periodic estimates showing the value of the work performed during each period based upon the approved breakdown of the contract price.

- Such estimates shall be submitted not later than ----- days in advance of the date set for payment and are subject to correction and revision as required.
- The estimates must be approved by GDPM prior to payment.
- If the contract covers more than one project, the Contractor shall furnish a separate progress payment estimate for each.

7.4.4. Along with each request for progress payments and the required estimates, the Contractor shall furnish the following certification, or payment shall not be made:

7.4.4.1. I hereby certify, to the best of my knowledge and belief, that:

- The amounts requested are only for performance in accordance with the specifications, terms, and conditions of the Contract;
- Payments to subcontractors and suppliers have been made from previous payments received under the contract, and timely payments will be made from the proceeds of the payment covered by this certification, in accordance with subcontract agreements; and
- This request for progress payments does not include any amounts which the prime Contractor intends to withhold or retain from a subcontractor or supplier in accordance with the terms and conditions of the subcontract.
7.5. Allowances

7.5.1. The Contract Sum includes the Allowances (if any) identified in the Contract.

7.5.2. All allowances include the costs to the Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes.

7.6. Unit Prices

7.6.1. Where the Contract provides that all or a part of the Work is to be Unit Price Work, initially that Contract Sum will include for all Unit Price Work:

7.6.1.1. An amount equal to the sum of the established Unit Prices for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Contract

7.6.1.2. The Contractor’s fee on that Unit Price Work

7.6.2. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Sum.

7.6.2.1. GDPM will determine the actual quantities and classifications of Unit Price Work performed by the Contractor.

7.6.2.2. Before final payment, an appropriate Change Order will be issued to reconcile the Contract Sum so that it reflects actual amount due to the Contractor on account of Unit Price Work actually performed.

7.7. Schedule of Values

7.7.1. Within seven days after issuance of Letter of Intent or other period as mutually agreed by the Contractor and GDPM, the Contractor shall submit to GDPM a Schedule of Values on a form provided for by GDPM, with separate amounts shown for labor and materials for each branch of Work.

7.7.1.1. The Contractor shall clearly indicate on the Schedule of Values, but is not necessarily limited to, the cost of payment and performance bond(s), permit costs, the amount(s) allocated, including separate items for the Contractor’s Fee (Overhead and Profit), and the amount(s) of labor and materials, as appropriate.

7.7.2. The grand total shown on the Schedule of Values shall equal the total Contract Sum.

7.7.3. GDPM may use the approved Schedule of Values to determine cost or credit to GDPM resulting from any change in the Work.

7.7.3.1. The first items shall be a breakdown of the General Conditions Cost

7.7.3.2. The amounts for labor and materials shall accurately reflect the cost for each item.

7.7.3.2.1. The Contractor shall clearly indicate on the Schedule of Values, the amount(s) allocated, including separate items for Contractor’s Fee (overhead and profit), for each Section 3 certified Business used in the performance of the Work.

7.7.3.2.2. Contractor’s Fee shall be included in the totals for labor and materials.

7.7.3.3. If the material allocation exceeds 55 percent of the Contract Sum, the Contractor shall provide, upon request, sufficient information to support the higher percentage.

7.7.3.4. Subcontract Work shall show amounts for labor and materials.
7.7.3.2.3. Fringe benefits shall be shown as a part of labor costs.

7.7.3.5. When more than one major structure is included in the Work, the Contractor shall subdivide the Schedule of Values accordingly, with cost details for each structure shown separately.

7.7.3.6. The line items shall be coordinated with line items in the Project Schedule, which may require division of items of Work by area of the Project by floor, phase, or other appropriate area.

7.7.3.7. Mechanical and electrical Work shall be included in separate line items for all major pieces of equipment, and group smaller equipment items by type.

7.7.3.8. Line items shall be included for each Allowance, Punch List Work, Project Record Document Submittals, delivery of attic stock, and specified demonstrations and training.

7.7.4. GDPM may return the Schedule of Values to the Contractor for re-submittal if it does not meet the requirements or contains insufficient items or details of the Work, or approve the Schedule of Values if GDPM determines that it conforms to section 7.7.

7.7.5. No payment shall be made until the GDPM has approved the Contractor's Schedule of Values.

7.8. Labor Payments/Retainage

7.8.1. The unit or lump sum price stated in the contract shall be used in determining the amount to be paid and shall constitute full and final compensation for all the work.

7.8.2. Partial payment to the contractor for work performed under the lump sum price shall be based on a schedule prepared by the contractor and approved by GDPM and/or A/E who shall apportion the lump sum price to the major components entering into or forming a part of the work under the lump sum price.

7.8.3. GDPM shall make partial payments to the contractor for labor performed under either a unit or lump sum price contract at the rate of ninety per cent of the estimates prepared by Contractor and approved by the A/E.

7.8.4. All labor performed after the job is fifty per cent completed shall be paid for at the rate of one hundred per cent of the estimates submitted by the contractor and approved by GDPM and/or the A/E.

7.9. Material Payments/Retainage

7.9.1. Provided such materials have been inspected and found to meet the specifications, GDPM shall pay the Contractor at the rate of ninety percent of the invoice cost, not to exceed the scheduled value in a Unit Price or lump sum contract, for materials delivered to the Site, or other off-Site storage location approved by GDPM, provided the Contractor provides the following information with the Contractor Payment Request:

- A list of the fabricated materials consigned to the Project, giving the place of storage, together with copies of invoices, in order to verify quantity and cost; and
- A certification of materials stored off-site, prepared by the Contractor and signed-off on by GDPM and/or the A/E, to evidence that the materials are in conformity with the Specifications and have been tagged with the Project name and number for delivery to the Project.
7.9.2. The Contractor shall directly reimburse GDPM and/or the A/E for all costs incurred to visit a storage site, other than the areas adjacent to the Site.

7.9.3. Provided such materials have been inspected and found to meet the specifications, GDPM shall pay the balance of the scheduled value when the materials are incorporated into and becomes a part of the Work.

7.9.4. When payment is allowed for materials delivered to the Site or other off-site storage location, approved by GDPM, but not yet incorporated into the Project, such material shall become the property of the GDPM, but if such material is stolen, destroyed, or damaged by casualty before being used, the contractor shall be required to replace it at the contractor's own expense.

7.9.5. GDPM may, at its sole discretion, retain any material not ultimately incorporated into the Project or return it to the Contractor for credit of an amount proportionate to the value of the extra materials.

7.9.6. Payment on approved estimates filed with GDPM or its representative shall be made within thirty days.

7.9.7. Release of Retainage

7.9.7.1. When the Contractor has achieved Substantial Completion of all Work, and there is no other reason to retain funds; upon request of the Contractor, the funds retained in connection with the Work shall be released and paid to the Contractor, withholding only that amount necessary to assure faithful completion in the sole discretion of GDPM.

7.10. Payments Withheld

7.10.1. GDPM may withhold funds from or may assess Liquidated Damages against a Contractor Payment Request.

7.10.2. GDPM may decline to approve any Contractor Payment Request or part thereof, or nullify any previous Contractor Payment Request, in whole or in part, to the extent necessary in GDPM's sole opinion to protect GDPM from loss because of:

- Defective Work not remedied;
- Overpayment of any schedule of values line item without prior approval of related change order by Contracting Officer;
- Overpayment due to calculation error;
- Damage caused by the Contractor;
- Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- Reasonable evidence that the Work will not be completed within the Contract Times, and that the unpaid balance would not be adequate to cover damages under the Contract Documents for the anticipated delay;
- Failure to comply with Applicable Law including, but not limited to, the requirements of the Ohio Revised Code.
7.11. **Payment Request**

7.11.1. The Contractor and each of its subcontractors, regardless of tier, shall execute a Payment Release Affidavit to certify that the Contractor and each of its subcontractors, regardless of tier, have complied with all applicable requirements of the ORC, and to certify that all of its subcontractors have been paid in full for all Work performed or materials furnished under the Contract.

7.11.2. GDPM shall pay Contractor in approximately 30 days from the date of acceptance of the Payment Request.

7.11.3. The Contractor, as a condition precedent to final payment, shall complete all requirements of the

7.11.4. Acceptance of final payment by the Contractor or a Subcontractor constitutes the payee's waiver of all claims against GDPM except those previously made in writing and identified by that payee as unsettled at the time of the final Contractor Payment Request.

8 **Article VIII: Contract Modifications**

8.1. **Changes in Work**

8.1.1. GDPM may order changes in the Work without invalidating the Contract, subject to the limitations set forth in this Article and elsewhere within the Contract Documents, a change in the Work may be accomplished by a Change Order, Change Directive, or order for a minor change in the Work.

8.1.2. Except as provided, no order, statement or conduct of GDPM shall be treated as a change or entitle the Contractor to an equitable adjustment.

8.1.3. Only GDPM's Contracting Officer has authority to modify any term or condition of this Contract. Any Contract modification shall be authorized in writing.

8.1.4. The Contracting Officer may modify the contract unilaterally:
   - Pursuant to a specific authorization stated in a Contract clause; or
   - For administrative matters which do not change the rights or responsibilities of the parties.

8.1.5. All other contract modifications shall be in the form of supplemental agreements signed by the Contractor and GDPM.

8.1.6. Except as expressly stated herein, the Contractor’s failure to obtain prior written authorization from GDPM for a change in the Work constitutes a waiver by the Contractor of an adjustment to the Contract Sum or Contract Time or both.

8.1.7. The Contractor shall perform all changes in the Work under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly with the change unless otherwise provided in the Change Order, Change Directive or order for a minor change in the Work.

8.1.8. **HUD Approval:** When a proposed modification requires the approval of HUD prior to its issuance; such modification shall not be effective until the required approval is received by GDPM.

8.2. **Change Order**

8.2.1. GDPM may, at any time, without notice to the sureties, by written order designated or indicated to be a change order, make changes in the Work within the general scope of the
Contract including changes:
- In the specifications (including drawings and designs);
- In the method or manner of performance of the Work;
- GDPM-furnished facilities, equipment, materials, services, or site; or
- Directing the acceleration of the Work.

8.3. Increase or decrease of cost

8.3.1. If any change causes an increase or decrease in the Contractor’s cost of, or the time required for the performance of any part of the Work under this contract, whether or not changed by any such order, GDPM shall make an equitable adjustment as set forth in Section 8.8 Change Order Cost or Credit Determination below and modify the Contract in writing.

8.3.2. The Contractor shall proportionally increase the amount of the Bond whenever the Contract Sum is increased.

8.3.3. If any notice of any change affecting the Contract is required by the provision of the Bond, notice is the Contractor’s responsibility.

8.3.4. Except for an adjustment based on defective specifications, no proposal for any change shall be allowed for any costs incurred more than 20 days before the Contractor gives written notice as required.

8.3.4.1. In the case of defective specifications for which GDPM is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specification.

8.3.5. The Contractor must assert its right to an adjustment within 30 days after:

8.3.5.1. Receipt of a written change order, or

8.3.5.2. The furnishing of a written notice by submitting a written statement describing the general nature and the amount of the proposal.

8.3.6. If the facts justify it, GDPM may extend the period for submission.

8.4. Change Directive

8.4.1. Notwithstanding Form HUD-5370 Article 29(b), Parties agree that Change Order Directives may be utilized during the course of the Work.

8.4.2. A Change Directive is a written order prepared by GDPM directing a change in the Work and may, if necessary, state a proposed basis for adjustment, if any, of Contract Sum or Contract Time, or both.

8.4.3. A Change Directive shall be used to direct a change in the Work in the absence of a total agreement on the terms of a Change Order and shall only be used in the absence of total agreement on the terms of a Change Order concerning the associated change of the Work.

8.4.4. Upon receipt of a Change Directive, the Contractor shall promptly proceed with the change in the Work involved.

8.4.5. Within 14 days after receiving the Change Directive, the Contractor shall respond with a
Change Order Proposal for adjustment of the Contract Sum or Contract Time or both.

8.4.6. If the Contractor does not respond to the Change Directive as required above, GDPM shall determine the adjustments, if any, of the Contract Sum and Contract Times.
   • If the Contractor does not agree with GDPM’s determination, the Contractor shall initiate a claim within 10 days of the date on which GDPM issues the determination, and the Contractor’s failure to do so shall constitute an irrevocable waiver the Claim.

8.4.7. If GDPM and the Contractor agree on the adjustment of the Contract Sum and Contract Time associated with the Change Order Directive, GDPM shall prepare an appropriate Change Order.

8.5. Change Order Procedure

8.5.1. Any Change Order Request must be in writing and submitted by the Contractor to GDPM in accordance with the Notice Provision.

8.5.2. The Contractor’s cost of preparing and providing Proposals is included in the Contract Sum.

8.5.3. If GDPM Agrees with Change Order Proposal:
   • GDPM shall prepare each Change Order, attach the supporting documentation, and issue the Change Order to the Contractor for signature.
   • Within 3 days after issuance of Change Order to Contractor, Contractor must sign the Change Order and resubmit to GDPM.
   • Change Order is not approved until GDPM’s Contracting Officer signs the Change Order.

8.5.4. If GDPM disagrees with Change Order Proposal or Contracting Officer doesn’t approve Change Order:
   • GDPM will notify Contractor in writing with reasons; and
   • Contractor has 14 days to modify the Change Order Request or invoke Article Dispute Resolution/Claim Procedure.
   • Failure to reach an agreement on any proposal shall be a dispute under Article Dispute Resolution/Claim Procedure.

8.5.5. Nothing in the change order procedure, however, shall excuse the Contractor from proceeding with the contract change pursuant to an issued Change Directive.

8.6. Change Order Proposal

8.6.1. The Contractor’s written proposal for equitable adjustment shall be submitted in the form of a lump sum proposal supported with an itemized breakdown of all increases and decreases in the contract with at least the following details:

8.6.1.1. Direct Costs:
   • Materials (list individual items, the quantity and unit cost of each, and the aggregate cost)
   • Transportation and delivery costs associated with materials
   • Labor breakdowns by hours or unit costs (identified with specific Work to be performed)
   • Construction equipment exclusively necessary for the change
   • Costs of preparation and/or revision to shop drawings resulting from the change
   • Worker’s Compensation and Public Liability Insurance
- Employment taxes under FICA and FUTA
- Bond Costs

8.6.1.2. **Indirect Costs:** Indirect costs may include overhead, general and administrative expenses, and fringe benefits not normally treated as direct costs.

8.6.1.3. **Profit:**

8.6.1.3.1. The amount of profit shall be negotiated and paid in accordance with Section 8.9 Change Order Cost or Credit Determination below and may vary according to the nature, extent, and complexity of the work required by the change.

- The allow-ability of the direct and indirect costs shall be determined in accordance with the Contract Cost Principles and Procedures for Commercial Firms in Part 31 of the Federal Acquisition Regulation (48 CFR 1-31), in effect on the date of this Contract.
- The Contractor shall not be allowed a profit on the profit received by any subcontractor.
- Equitable adjustments for deleted work shall include a credit for profit and may include a credit for indirect costs.
- On proposals covering both increases and decreases in the amount of the contract, the application of indirect costs and profit shall be on the net-change in direct costs for the Contractor or subcontractor performing the Work.

8.6.2. The Contractor shall include in the proposal its request for time extension (if any), and shall include sufficient information and dates to demonstrate whether and to what extent the change will delay the completion of the Contract in its entirety.

8.6.3. GDPM shall act on proposals within 30 days after their receipt, or notify the Contractor of the date such action will be taken. Equitable adjustments shall be made in accordance with Section 8.9 Change Order Cost or Credit Determination below

8.6.4. Failure to reach an agreement on any change order proposal shall be a dispute under the Disputes Article herein. Nothing in this Section, however, shall excuse the Contractor from proceeding with the contract as changed.

8.6.5. By signing a Change Order, the Contractor irrevocably certifies that the elements of a Change Order described herein are completely satisfied, and waives all rights, if any, to seek further adjustment of the Contract Sum or Contract Times, or both, at a later date with respect to the associated change in the Work, including without limitation on account of the "cumulative impact" of the associated change in the Work in combination with one or more of the other changes in the Work.

8.6.6. No proposal by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this Contract.

8.6.7. Except in an emergency endangering life or property, as determined by GDPM, no change shall be made by the Contractor without a prior written authorization from GDPM's Contracting Officer. When the Change Order is signed by the Contractor and GDPM's Contracting Officer, the fully executed Change Order modifies the Contract Documents and authorizes and directs the Contractor to proceed, and the Contractor shall promptly proceed.
8.7. Differing Site Conditions

8.7.1. The Contractor shall promptly, and before the conditions are disturbed, give a written notice to GDPM of:

- Subsurface or latent physical conditions at the site which differ materially from those indicated in this contract; or

- Unknown physical conditions at the site(s), of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in the Contract. Written notice of the condition shall be given immediately to GDPM.

- The Contractor's failure to give notice of the Differing Site Condition as required shall constitute an irrevocable waiver of any associated claim.

8.7.2. GDPM shall investigate the site conditions promptly after receiving the notice.

- Work shall not proceed at the affected site, except at the Contractor's risk, until GDPM has provided written instructions to the Contractor.

- If the conditions do materially so differ and cause an increase or decrease in Contractor's cost of, or the time required for, performing any part of the Work under this Contract, whether or not changed as a result of the conditions, the Contractor shall file a claim in writing to GDPM within ten days after receipt of such instructions and, in any event, before proceeding with the Work.

- An equitable adjustment in the Contract price, the delivery schedule, or both shall be made under this Section and in accordance with Section 8.9 Change Order Cost or Credit Determination below, and the Contract modified in writing accordingly.

8.7.3. No request by Contractor for an equitable adjustment to the Contract under this Section shall be allowed, unless the Contractor has given the written notice required; provided that the time prescribed for giving such written notice may be extended by GDPM.

8.7.4. No request by Contractor for an equitable adjustment to the Contract under this Section shall be allowed if made after final payment under this contract.

8.7.5. If GDPM determines that the Contractor has not encountered a Differing Site Condition and the Contractor does not agree with that determination, the Contractor must initiate a Claim within 10 days of the date that GDPM issues its determination.

8.8. Minor Changes in the Work

8.8.1. Notwithstanding Form HUD-5370 Article 29(b), GDPM may order minor changes in the Work not involving adjustment of the Contract Sum or extension of the Contract Times and not inconsistent with the intent of the Contract Documents.

- Such changes shall be effected by written order ("no cost change order") issued to the Contractor.

8.8.2. The Contractor shall promptly carry out each order for a minor change in the Work if the Contractor agrees that the order does not involve adjustment of the Contract Sum and Contract Times.

8.8.3. If the Contractor reasonably believes that it would be entitled to an adjustment of the Contract Sum or Contract Times, or both, on account of an order for a minor change in the Work, the Contractor, within 3 business days after receiving the order, shall give GDPM written notice of the Contractor's position, and not proceed with the subject Work without
first receiving a Change Order related to it.

8.8.4. The Contractor waives its right to an adjustment of the Contract Sum or Contract Times on account of an order for a minor change in the Work by:
   a. Starting the Work that is the subject of the order for a minor change in the Work; or
   b. Failing to give the notice described herein within 3 business days after receiving the order for a minor change in the Work.

8.9. Change Order Cost or Credit Determination

8.9.1. Notwithstanding any provisions set forth in this Section 8.8 Change Order Cost of Credit Determinations, the allowability of any direct and indirect costs shall be determined in accordance with the Contract Cost Principles and Procedures for Commercial Firms in Part 31 of the Federal Acquisition Regulation (48 CFR1-31), as implemented by HUD Handbook 2210.18, in effect on the date of this Contract.

8.9.2. The maximum cost or credit resulting from a change in the Work shall be determined as described below.
   a. Proposals shall include the information required.
   b. A Unit Price Proposal shall only be valid when incorporated into the Contract by Change Order.
   c. The maximum cost or credit includes all compensation for impact costs. However, additional costs for impacts shall not be allowed.

8.9.3. The Contractor shall not assign any portion of the Work to another Person whereby the Contractor would benefit directly or indirectly from the double application of charges for overhead or profit.

8.9.4. GDPM may require notarized invoices for material costs and may audit the records of the Contractor and Subcontractors.

8.9.5. For each change in the Work, the Contractor shall furnish a detailed Proposal itemized on the Proposal Worksheet Summary Form published by GDPM through which the Contractor shall document the related changes in the Contract Sum.
   a. Any Subcontractor pricing shall also be itemized on the Proposal Worksheet Summary Form.

8.9.6. Pricing Criteria

8.9.6.1. This Section Pricing Criteria establishes the exclusive and maximum amount that GDPM shall pay for any Change Order, including, but not limited to, all amounts for interference with, delay, hindrance, disruption, or impact of the Work
   a. These Pricing Criteria also govern the value of deduct Change Orders and the Contractor’s entitlement to additional compensation or damages through the claims and dispute resolution processes on account of changes in the Work.

8.9.6.2. In order to expedite the review and approval process, Proposals shall be prepared in the categories and order as listed below.

8.9.6.3. Contractor Personnel Costs
   a. The Contractor’s on-Site management (including supervision and administrative personnel) are not subject to State or Federal Prevailing Wage Rates.
   b. These costs will be calculated on an hourly basis according to the rates acceptable to GDPM.
   c. In no event will the Contractor be entitled to an increase in the Contract Sum on account of Contractor Personnel Costs unless the Contractor actually incurs
additional Contractor Personnel Costs solely on account of the associated change in the Work.

8.9.6.4. **Labor**

a. Field labor directly involved in the Work shall be based upon the actual rate of pay to the worker.

b. If the Project is subject to payment of prevailing wage rates, field labor shall be paid according to the relevant classification of labor as established in the applicable prevailing wage determination.

c. In no event will the Contractor be entitled to an increase in the Contract Sum on account of labor costs unless the Contractor actually incurs additional labor costs solely on account of the associated change in the Work.

d. Under no conditions will the increase exceed those additional labor costs the Contractor actually incurs.

e. The cost for supervision above the level of working forepersons (such as general forepersons, superintendent, project manager, etc.) is included in the adjustment to Contractor Personnel Costs.

8.9.6.5. **Fringes**

a. Fringe benefit credit for labor is only allowable for prevailing wage fringe benefits including, but not limited to, Health and Welfare, vacation, apprenticeship training, and certain types of pension plans.

b. Each fringe benefit for which credit is requested shall be calculated on an hourly basis and listed as a separate line item.

c. The Contractor shall submit documentation supporting the calculation of the amounts for each fringe benefit for each worker classification, including labor provided by Subcontractors.

8.9.6.6. **Allowable Payroll Expenses:** Allowable payroll expenses for labor including payroll taxes as well as other benefits that are required by Applicable Law, shall each be a separate line item.

8.9.6.7. **Equipment Rentals**

a. All charges for certain non-owned heavy or specialized equipment at up to 100 percent of the documented rental cost

b. No rental charges shall be allowed for hand tools, minor equipment, simple scaffolds, etc.

c. Downtime due to repairs, maintenance and weather delays shall not be allowed.

d. Contractor shall submit copies of actual paid invoices to substantiate rental costs.

8.9.6.8. **Owned Equipment**

a. All charges for certain heavy or specialized equipment owned by the Contractor or Subcontractor performing the Work shall be paid at up to 100 percent of the cost listed by the current edition of the Associated Equipment Distributors' *AED Green Book* heavy equipment rental rates.

b. No recovery shall be allowed for hand tools, minor equipment, simple scaffolds, etc.

c. The longest period of time that the equipment is to be required for the Work shall be the basis for the pricing.

d. Downtime due to repairs, maintenance, and weather delays shall not be allowed.

8.9.6.9. **Trucking**

a. A reasonable delivery charge or per-mile trucking charge for delivery of required
materials or equipment.

b. Charges for use of a pick-up truck shall not be allowed.

8.9.6.10. **Materials**

a. The actual cost (including all discounts, rebates or related credits) of all materials incorporated into the changed Work.

b. Documentation shall show costs, quantities, or Unit Prices of all items, as appropriate.

c. The cost or credit for reusable materials shall be limited to 33 percent of the material cost for each use.

8.9.6.11. **Contractor's General Conditions Costs**

a. The Contractor's General Conditions Costs to the extent attributable to an associated change in the Contract Time for achievement of Final Acceptance resulting from the change in Work.

b. In no event shall the Contract Sum adjustment per day of Contract Time adjustment exceed an amount equal to (1) the sum of the General Conditions Costs line items in the Contractor's Schedule of Values approved by GDPM, (2) divided by the total number of days of the original Contract Time for achievement of Final Acceptance.

c. The Contractor shall:
   - Exclude the bond premium from the Schedule of Values for the purposes of the calculation; and
   - Include the actual adjustment of the Bond Premium attributable to an associated change in the Contract Sum.

d. If the Contractor purchases Builder's Risk insurance for the Project, the Contract shall:
   - Exclude the Builder's Risk insurance premium from the Schedule of Values for the purposes of the calculation; and
   - Include the actual adjustment of the Builder's Risk insurance premium attributable to an associated change in the Contract Sum.

8.9.6.12. **Subcontractor Overhead and Profit**

a. Adjustment of the Contract Sum on account of a change in Subcontractor-performed Work shall include the Subcontractor's aggregate overhead and profit allowance equal to 15 percent of the sum of the Subcontractor's costs that are associated with that changed Work.

b. The allowance applies to each Subcontractor tier.

c. The allowance covers:
   1. The costs required to schedule and coordinate the Work
   2. Telephone
   3. Telephone charges
   4. Facsimile
   5. Telegrams
   6. Postage
   7. Photos
   8. Photocopying
   9. Hand tools
   10. Simple scaffolds (one level high)
   11. Tool breakage
12. Tool repairs
13. Tool replacement
14. Tool blades
15. Tool bits
16. Home office estimating and expediting
17. Home office clerical and accounting support
18. Home office labor (management, supervision, engineering)
19. All other home office expense, legal services, travel, and parking expenses

d. An exception is allowed for shop or engineering labor, which shall not be subject to Prevailing Wage rates for steel fabricators, sheet metal fabricators, and sprinkler system fabricators performing work off-site.
  o Recovery for these matters shall be allowed on an hourly basis.
e. An exception is allowed for field supervision labor, for those portions of the Change Order Work that will be performed, or was performed, at times when the superintendent is not required to be on site, including but not limited to overtime hours due to acceleration and extensions of the Contract Times.
  o Recovery for this matter will be allowed on an hourly basis.

8.9.6.13. **Contractor’s Fee**: Adjustment of the Contract Sum on account of a change in the Work shall include an allowance for the Contractor’s Fee equal to 10 percent of the sum of the costs that are associated with that changed Work.

8.9.6.14. **Miscellaneous**

  a. Adjustment of the Contract Sum on account of a change in Work may include the following costs with no allowance for Contractor’s Fee or Subcontractor overhead and profit.
     - The premium portion only for approved overtime (labor and fringes).
     - The straight time portion is included.

8.9.6.15. **Costs that shall not be reimbursed for Change Order Work include the following**

  b. Voluntary employee deductions including, but not limited to, deductions for charitable donations or U.S. savings bonds
  c. Employee profit sharing

8.10. **Time Extension**

8.10.1. Contractor’s Change Order Proposal shall include sufficient information and dates to demonstrate whether and to what extent the change will delay the completion of the Contract in its entirety. Every adjustment of the Contract Times associated with any Change Order Proposal shall be determined as provided herein, which establishes the Contractor’s maximum entitlement for any change in the Work, including without limitation all adjustments for interference, delay, hindrance, or disruption of the Work.

8.10.2. This also governs time adjustments for deduct Change orders and Contractor’s entitlement to additional time through the claims and dispute resolution process on account of changes in the Work.

8.10.3. The Contractor shall substantiate all changes in the Contract Times with:

  a. A written description of the nature of the interference, disruption, hindrance or
delay ("disruption or delay");
b. Identification of Persons and events responsible for the disruption or delay;
c. Date, or anticipated date, of commencement of the disruption or delay;
d. Identification of activities by schedule activity number and name on the Construction Progress Schedule, which may be affected by the disruption or delay, or new activities created by the disruption or delay and the relationship with existing activities;
e. Anticipated duration of the disruption or delay and of any remobilization period;
f. Specific number of days of extension requested and specific number of days for remobilization requested;
g. Recommended action to avoid or minimize any future disruption or delay; and
h. A detailed written proposal for an increase in the Contract Sum which would fully compensate the Contractor for all costs of acceleration of the Work needed to completely overcome the associated delay, if any.

8.10.4. A Change Order may authorize extension of the Contract Time for specific elements, while maintaining milestone dates for unaffected elements. Such a Change Order may also authorize an appropriate adjustment to Liquidated Damages.

8.11. **Critical Path**

8.11.1. Time extensions shall depend upon the extent to which the Work on the critical path of the Construction Progress Schedule is affected.

8.12. **Granting Time Extension**

8.12.1. A Change Order granting a time extension may provide that the Contract Times shall be extended for only elements so interfered with, disrupted, hindered, or delayed and related remobilization and that shall not be altered and may further provide for adjustment of Liquidated Damages.

9 **ARTICLE IX: DISPUTE RESOLUTION & CLAIM PROCEDURE**

9.1. **General**

9.1.1. "Claim," as used in this Article, means a written demand or written assertion by one of the contracting parties seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract terms, or other relief arising under or relating to the contract.

9.1.2. A claim arising under the Contract, unlike a claim relating to the contract, is a claim that can be resolved under a contract clause that provides for the relief sought by the claimant.

9.1.3. A voucher, invoice, application for payment, or other routine request for payment that is not in dispute when submitted is not a Claim. However, the submission may be converted to a Claim by complying with the requirements of this Article, if it is disputed either as to liability or amount or is not acted upon in a reasonable time.

9.1.4. Except for disputes arising under the article entitled Labor Standards - Davis Bacon and Related Acts, herein, all disputes arising under or relating to this Contract, including any claims for damages for the alleged breach thereof which are not disposed of by agreement, shall be resolved under this Article.

9.1.5. All Claims by the Contractor shall be made in writing and submitted to GDPM for a written decision.
9.1.6. A claim by GDPM against the Contractor shall be subject to a written decision by the Contracting Officer.

9.2. Initiation of a Claim by Contractor

9.2.1. Every Claim shall accrue upon the date of occurrence of the event giving rise to the Claim.

9.2.2. Except as provided, the Contractor shall initiate every Claim by giving written notice of the Claim to GDPM within fourteen (14) days after occurrence of the event giving rise to the Claim, with the following exceptions:

9.2.2.1. The 14-day time limit on initiating a Claim arising from the response of an RFI by GDPM begins to run on the date of the response.

9.2.2.2. The 14-day time limit on initiating a Claim arising from GDPM’s determination concerning a Differing Site Condition begins to run on the date of the determination.

9.2.2.3. Contractor’s written notice of claim must be delivered to the Contracting Officer prior to GDPM’s issuance of final contract payment.

9.2.3. The Contractor’s written notice of a Claim shall provide the following information:

9.2.3.1. Nature and anticipated amount of the impact, including all costs for any interference, disruption, hindrance, or delay, which shall be calculated and be a fair and reasonably accurate assessment of the damages suffered or anticipated by the Contractor;

9.2.3.2. Identification of the circumstances responsible for causing the impact, including, but not limited to, the date or anticipated date, of the commencement of any interference, disruption, hindrance, or delay;

9.2.3.3. Identification of activities on the Construction Progress Schedule that will be affected by the impact or new activities that may be created and the relationship with existing activities;

9.2.3.4. Anticipated impacts and anticipated duration of any interference, disruption, hindrance, delay, or impact, and any remobilization period; and

9.2.3.5. Recommended action to avoid or minimize any interference, disruption, hindrance, delay, or impact.

9.2.4. The Contractor’s failure to initiate a Claim as and when required shall constitute the Contractor’s irrevocable waiver of the Claim.

9.3. Substantiation of Claims General

9.3.1. Within 30 days after the initiation of a Claim, the Contractor shall submit to the project manager or other GDPM designee, an electronic copy of all information and statements required to substantiate a Claim and all other information that the Contractor believes substantiates the Claim.

9.3.2. The Contractor shall file the one electronic copy with GDPM.

9.3.3. The Contractor shall substantiate all of its Claims by providing the following minimum information:

- A narrative of the circumstances, which gave rise to the Claim, including without limitation the start date of the event or events and the actual or anticipated finish date;
- Detailed identification of the Work affected by the event giving rise to the Claim;
• Copies of the Contractor's daily log for each day of impact;
• Copies of relevant correspondence and other information regarding or supporting Contractor's entitlement;
• Copies of any and all information related to the Contractor's costs, including all job cost reports, bid take offs, and other financial information related to the Contractor's Claim;
• A notarized certification

9.4. **Substantiation of Claims for increase of the Contract Sum**

9.4.1. In addition to the minimum information required by Contractor, the Contractor shall substantiate each Claim for an increase of the Contract Sum with:

• Written documentation of the actual additional direct and indirect costs to the Contractor due to the event giving rise to the Claim;
• A written statement from the Contractor that the increase requested is the entire increase in the Contract Sum associated with the Claim; and
• The general substantiation documentation.

9.5. **Substantiation of Claims for Extension of the Contract Time**

9.5.1. In addition to the minimum information required by Contractor, the Contractor shall substantiate each Claim for an extension of the Contract Times with:

• Written documentation of the actual delay to the critical path of the Construction Progress Schedule due to the event giving rise to the Claim;
• A detailed written Proposal for an increase in the Contract Sum that would fully compensate the Contractor for all costs of acceleration of the Work needed to completely overcome the associated delay, A written statement from the Contractor that the extension requested is the entire extension of the Contract Times associated with the Claim; and
• The general substantiating documentation.

• In addition, if adverse weather conditions are the basis for a Claim for additional time, the Contractor shall document the Claim with data substantiating that weather conditions were abnormal for the period, could not have been reasonably anticipated, and had an adverse effect on a critical element of the scheduled construction.

9.6. **Certification of a Claim**

9.6.1. The Contractor shall certify each Claim within 30 days after initiating the Claim or before Contract Completion, whichever is earlier, by providing the notarized certification specified below, signed and dated by the Contractor:

"The undersigned Contractor certifies that the Claim is made in good faith; that the supporting data is accurate and complete to the best of the Contractor’s knowledge and belief; that the amount requested is a fair, reasonable, and necessary adjustment for which the Contractor believes that GDPM is liable; and that the undersigned is duly authorized to certify the Claim on behalf of the Contractor."
9.7. Delay and Delay Damage Limitations

9.7.1. Subject to other provisions of the Contract, the Contractor will be entitled to an extension of the Contract Times if Contractor demonstrates that delay is "excusable". To be excusable, the delay must be a delay in the commencement or progress of Work on the critical path of the Construction Progress Schedule and shall be caused by acts of unforeseeable nature or the public enemy, acts of the government not arising from the Contractor’s failure to comply with Applicable Law, fires, floods, epidemics, weather, and labor disputes beyond the Contractor’s control. The delay shall be beyond the control of the Contractor and without fault or negligence of Contractor and shall be unforeseeable prior to submitting a response to the initial solicitation for construction Work.

9.7.2. Notwithstanding any other provision of the Contract Documents to the contrary, the Contractor shall not be entitled to an increase in the Contract Sum, or an extension of the Contract Times, or both:

- On account of the impact of any normal adverse weather on any of the Work or on account of the impact of any abnormal adverse weather on Work not on the critical path;
- Unless contractor demonstrates that the event giving rise to the claim caused a delay to the overall completion of the Contract;
- To the extent that a delay occurs concurrently with a delay attributable to the Contractor; or
- On account of the delay of any Work not on the critical path.

9.7.3. When the Contractor is prevented from completing any part of the Work on the critical path within the Contract Time due to weather conditions, provided the Contractor properly initiates a Claim, the Contract Time will be extended by one (1) day for each work day lost due to weather that delays Work on the critical path in excess of those in the following table:

<table>
<thead>
<tr>
<th>Month(s)</th>
<th>Number of Workdays Lost Due To Weather</th>
</tr>
</thead>
<tbody>
<tr>
<td>January &amp; February</td>
<td>8</td>
</tr>
<tr>
<td>March</td>
<td>7</td>
</tr>
<tr>
<td>April</td>
<td>6</td>
</tr>
<tr>
<td>May</td>
<td>5</td>
</tr>
<tr>
<td>June - August</td>
<td>4</td>
</tr>
<tr>
<td>September</td>
<td>5</td>
</tr>
<tr>
<td>October &amp; December</td>
<td>6</td>
</tr>
</tbody>
</table>

9.7.4. Contractor shall not be entitled to an increase in Contract Time and/or Contract Sum for non-delays. Non-excusable delays include, but are not limited to, delays which are foreseeable or preventable by the Contractor (e.g. financial difficulties, supplier delays where supplies are obtainable from other source, defective specifications where defect is apparent prior to start of the Contract Work.).

9.7.5. Notwithstanding any other provision of the Contract Documents to the contrary, the Contractor shall not be entitled to an increase in the Contract Sum or any type of damages on account of a delay in the commencement or progress of Work on the critical path. Such claims may be compensable in limited circumstances and in accordance with the following:

9.7.5.1. GDPM Ordered Suspension of Work. Increased sum may be permitted for increased costs of performance, excluding profit, for "unreasonable delays", ordered by GDPM.
9.7.5.2. Constructive Suspension of Work: work is prevented by GDPM without express order of Contracting Officer (e.g. delay in issuance of notice to proceed, delay in availability of site, delay due to interference with Contractor's Work, delay of approvals, delay in inspections).

9.7.5.3. If GDPM does not order a Suspension of Work, the delay will generally not be compensable unless Contractor demonstrates that GDPM is solely at fault for the delay (e.g. GDPM implied duty to cooperate).

9.7.5.4. For such delay claims, Contractor must notify GDPM in writing within 14 days of event giving rise to the claim.

9.7.5.5. For such delay claims, potential recovery is limited to:

9.7.5.5.1. Indirect cost increase that occurred during the extended performance period;

9.7.5.5.2. Unabsorbed office overhead that occurred during the extended performance; period

9.7.5.5.3. Material cost increases that occur during the delay;

9.7.5.5.4. Lost productivity caused by the delay;

9.7.5.5.5. Damages directly related to or attributable to the delay.

9.7.6. Notwithstanding any other provision of the Contract Documents to the contrary, the Contractor shall not be entitled to an increase in the Contract Sum or any type of damages arising from a delay in the commencement or progress of Work caused by the occurrence or non-occurrence of an event beyond GDPM's control such as acts of Nature or the public enemy, acts of the government, fires, floods, epidemics, labor disputes, unusual delivery delays, weather, or damages caused by the Contractor.

9.8. Derivative Claims

9.8.1. Notwithstanding any other provision of the Contract Documents to the contrary, if GDPM prosecutes a claim, suit, or appeal against a Separate Consultant or Separate Contractor to recover damages the Contractor suffers on account of the acts or negligent acts of a Separate Consultant or Separate Contractor or person or entity for whom either is legally responsible, GDPM's liability to the Contractor shall not exceed the amount GDPM actually recovers from the Separate Consultant or Separate Contractor on account of those damages less the costs GDPM incurs recovering them. GDPM is not obligated to prosecute any such claim, suit, or appeal.

9.9. Claim Decision

9.9.1. GDPM shall, within 60 (unless otherwise indicated) days after receipt of the request, decide the claim or notify the Contractor of the date by which the decision will be made.

9.9.2. The Contracting Officer's decision shall be final unless the Contractor:

• Appeals in writing to a higher level at GDPM in accordance with GDPM's policy and procedures;

• Refers the appeal to an independent mediator or arbitrator; or

• Files suit in a court of competent jurisdiction. Such appeal(s) must be made within 15 days after receipt of GDPM's decision.
9.9.3. The Contractor shall proceed diligently with performance of the contract, pending final resolution of any request for relief, claim, appeal, or action arising under or relating to the contract, and comply with any decision of GDPM.

9.10. **Audit of a Claim**

9.10.1. All Claims shall be subject to audit at any time following filing of the Claim, whether or not the Claim is part of a lawsuit.

9.10.2. The audit may be performed by GDPM staff or by a consultant engaged by GDPM.

9.10.3. The audit may begin upon 10-days' notice to the affected Contractor or affected Subcontractor.

9.10.4. The Contractor shall cooperate with the request.

9.10.5. Failure of the Contractor or Subcontractor to produce sufficient records to allow GDPM to audit and verify a Claim shall constitute an irrevocable waiver of the Claim or portion of the Claim that could not be completely audited.

9.10.6. The Contractor shall make available to GDPM all Contractor and Subcontractor documents related to the Claim including, without limitation, the following documents:

1. Daily time sheets and superintendent's daily reports;
2. Union agreements, if any, and employer agreements;
3. Insurance, welfare, fringes, and benefits records;
4. Payroll tax returns;
5. Material invoices, purchase orders, Subcontracts, and all material and supply acquisition contracts;
6. Material cost distribution worksheets;
7. Equipment records (list of Contractor equipment, rates, etc.);
8. Vendor rental agreements and Subcontractor invoices;
9. Subcontractor payment certificates;
10. Canceled checks (payroll and vendors);
11. Job cost report;
12. Job payroll ledger;
13. General ledger, general journal, (if used) and all subsidiary ledgers and journals together with all supporting documentation pertinent to entries made in these ledgers and journals;
14. Cash disbursements journal;
15. Financial statements for all years reflecting operations on the Project;
16. Income tax returns for all years reflecting operations on the Project;
17. Depreciation records on all equipment utilized whether the records are maintained by the Contractor, its accountant, or others;
18. If a source other than depreciation records is used to develop costs for the Contractor's internal purposes in establishing the actual cost of owning and operating equipment, all other source documents;
19. All documents that reflect the Contractor's actual profit and overhead
during the years the Project was being performed;

20. All documents related to the preparation of the Contractor’s Bid, including the final calculations on which the Bid was based, unless the documents are placed in escrow under provisions of the Instructions to Bidders;

21. All documents that relate to the Claim together with all documents that support the amount of damages as to the Claim;

22. Worksheets used to prepare the Claim establishing the cost components for items of the Claim including, but not limited to, labor, fringes, benefits and insurance, materials, equipment, Subcontractors, and all documents that establish the periods of time, individuals involved, the hours and rate of pay for the individuals; and

23. All other documents requested by GDPM to review the Claim.

9.11. False Certification of a Claim

9.11.1. If the Contractor falsely certifies all or any part of a Claim, the portion of the Claim falsely certified shall be denied, and may be sufficient cause for GDPM to exclude Contractor from future contracting opportunities.

9.11.2. The Contractor shall not knowingly present or cause to be presented to GDPM a false or fraudulent Claim. "Knowingly" shall have the same meaning as in the Federal False Claims Act.

9.12. If the Contractor knowingly presents or causes to be presented a false or fraudulent Claim, then the Contractor shall be liable to the GDPM for the same civil penalty and damages as the United States Government would be entitled to recover and shall also indemnify and hold GDPM harmless from all costs and expenses, including GDPM's attorneys' and consultants' fees and expenses incurred in investigating and defending against such Claim and in pursuing the collection of such penalty, damages and fees and expenses.

9.13. Claims based upon Defective Specifications: Contractor may be entitled to compensation for increased costs of performance when increased cost is due to Contractor following GDPM-provided defective design specifications.

9.14. Claims based on GDPM ordered Change: If the Contracting Officer makes a direct change within the scope of the contract, Contractor may be entitled to an increase in Contract Sum or Time if the change increases or decreases the cost or time of performance. Recovery under this provision is limited to changes by the Contracting Officer or a formally designated representative. Contractor shall not be entitled to compensation for any change ordered by un-designated person even if such person is a GDPM agent or employee. Claims for changes must be asserted within 14 calendar days after written change order.

9.15. Claims based upon Differing Site Conditions: To be compensable, Claims based upon Differing Site Conditions is limited to the following:

9.15.1. Differing Site Condition must be an actual physical condition of the job site.

9.15.2. Differing Site Condition must have existed at the time of contract commencement

9.15.3. Differing Site Condition must not have been discoverable during site inspection.

9.15.4. Differing Site Condition must be of a nature that materially differs from conditions indicated in the information provided by GDPM in the solicitation documents.
9.15.5. Differing Site Condition must be an unknown and unusual condition that differs materially from what is ordinarily encountered on the particular type of Work in the particular locality (it must be unusual for that particular area).

9.16. **Subcontractor Claims:** A subcontractor shall not submit a claim directly to GDPM. Any claim related to a Subcontractor must be brought directly by and certified by the Contractor as if the Claim were brought by the Contractor itself. The Contractor may "sponsor" the Subcontractor Claim only by affirmatively and clearly agreeing to do so in writing and must be expressly permitted in the initial agreement between Contractor and Subcontractor. Any claim falsely certified will subject the Contractor to debarment from future GDPM contracting opportunities.

9.17. **Initiation of Claim by GDPM:** All GDPM initiated Claims must be presented within eight (8) years of notice of event giving rise to the Claim unless such claim is based upon breach of warranty in which case the term of the warranty shall apply.

10. **ARTICLE X: SUSPENSION AND TERMINATION**

10.1. **Suspension of the Work**

10.1.1. The Contracting Officer may order the Contractor in writing to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of GDPM.

10.1.2. If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted by an act of GDPM in the administration of this Contract, or by GDPM's failure to act within the time specified (or within a reasonable time if not specified) in this Contract, an adjustment shall be made for any increase in the cost of performance of the Contract (excluding profit) necessarily caused by such unreasonable suspension, delay, or interruption and the Contract modified in writing accordingly.

10.1.3. However, no adjustment shall be made for any suspension, delay, or interruption to the extent that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor or for which any equitable adjustment is provided for or excluded under any other provision of this Contract.

10.1.4. A claim shall not be allowed:

- For any costs incurred more than 14 calendar days before the Contractor shall have notified GDPM in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order); and
- Unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of the suspension, delay, or interruption, but no later than the date of final payment under the Contract.

10.1.5. If GDPM suspends the Work under this Article and the Contractor submits a proper Payment Request, subject to all other provisions of the Contract Documents, the Contractor shall be entitled to payment of compensation due under the Contract Documents for the Work performed before the suspension based upon the Schedule of Values.

10.1.6. GDPM, without prejudice to any other right or remedy it may have, may order the Contractor in writing to suspend, delay, or interrupt the performance of the Work in whole or in part for such period as GDPM may determine for any of the following reasons:

- Defective Work;
• The Contractor is causing undue risk of damage to any part of the Project or adjacent area;
• The Contractor fails to furnish or perform the Work in such a way that the complete Work will conform to the requirements of the Contract Documents; or
• Any other cause GDPM reasonably believes justifies suspension.

10.1.7. GDPM’s exercise of its right to suspend the Work shall not entitle Contractor to any adjustment of the Contract Sum, Contract Time or both.

10.1.8. Upon receipt of the notice of suspension, the Contractor shall cease Work on the suspended activities and take all necessary or appropriate steps to limit disbursements and minimize respective costs.

10.1.9. The Contractor shall furnish a report to GDPM within 5 days of receiving the notice of suspension, describing the status of the Work, including, but not limited to, results accomplished, resulting conclusions, and other information as GDPM may require.

10.1.10. GDPM’s right to stop the Work shall not give rise to any duty to exercise the right for the benefit of the Contractor or any other party, and GDPM’s exercise or failure to exercise the right shall not prejudice any of GDPM’s other rights including the right to suspend the Work in the future under the same or similar circumstances.

10.2. Termination for Convenience

10.2.1. GDPM, through the Contracting Officer, may terminate this contract in whole, or in part, whenever the Contracting Officer determines that such termination is in the best interest of GDPM.

10.2.2. Any such termination shall be effected by delivery to the Contractor of a Notice of Termination specifying the extent to which the performance of the work under the contract is terminated, and the date upon which termination becomes effective.

10.2.3. Upon delivery of the Notice of Termination, the Contractor shall immediately proceed with performance of the following duties in accordance with instructions from GDPM:

1. Cease operations as specified in the Notice;
2. Place no further orders and enter into no further subcontracts for materials, labor, services, or facilities, except as necessary to complete continued portions of the Project;
3. Terminate all subcontracts and orders to the extent they are related to the Work terminated;
4. Proceed with Work not terminated; and
5. Take actions that may be necessary, or that GDPM may direct, for the protection and preservation of the terminated Work.

Failure to do any actions set forth in this Provision (10.2.3), may lead to Contractor's liability for actual damages as a result of Contractor's failure to protect the Work.

10.2.4. If the performance of the work is terminated, either in whole or in part, GDPM shall be liable to the Contractor for reasonable and proper costs resulting from such termination upon the receipt by GDPM of a properly presented claim setting out in detail:

1. The total cost of the work performed to date of termination less the total amount of contract payments made to the Contractor;
2. The cost of settling and paying claims under subcontracts and material orders for
work performed and materials and supplies delivered to the site, payment for which
has not been made by GDPM to the Contractor or by the Contractor to the
subcontractor or supplier;

3. The cost of preserving and protecting the work already performed until GDPM or
assignee takes possession thereof or assumes responsibility therefore; and

4. An amount constituting a reasonable profit on the value of the work performed
by the Contractor.

10.2.5. Unless GDPM deems in writing that additional time is needed for review, GDPM will act
on the Contractor’s claim within 60 days of receipt of the Contractor’s claim.

10.2.6. Any disputes are expressly made subject to the Article titled Dispute Resolution and
Claim Procedure of this Contract.

10.2.7. If GDPM terminates the Work the termination shall not affect the rights or remedies of
GDPM against the Contractor then existing or which may thereafter accrue.

10.2.8. Notwithstanding this Provision 10.2 Termination for Convenience, if GDPM terminates the
Work but there exists an event of Contractor’s default, the Contractor shall be entitled to
receive only such amounts as it would be entitled to receive following the occurrence of an
event of default as provided for below.

10.3. Termination for Cause/Default

10.3.1. If the Contractor materially breaches this Contract, including without limitation, the
Contractor refuses or fails to prosecute the work, or any separable part thereof, with the
diligence that will insure its completion within the time specified in this Contract, or any
extension thereof, or fails to complete said work within this time, GDPM may, by written
notice to the Contractor, terminate the right to proceed with the work (or separable part
of the work) that has been delayed. Other examples of material breaches of the Contract
include but are not limited to:

- Refusal to remedy defective work;
- Failure to supply enough properly skilled workers or proper materials;
- Failure to provide revised Construction Progress Schedule or Recovery Plan;
- Failure to properly make payment to Subcontractors or Consultants; or
- Disregarding laws, ordinances, or rules, regulations, or orders of a public authority
  with jurisdiction over the Project.

10.3.2. In the event of a Termination under this Provision, GDPM may take over the work and
complete it, by contract or otherwise, and may take possession of and use any materials,
equipment, and plant on the work site necessary for completing the work.

10.3.3. The Contractor and its sureties shall be liable for any damage to GDPM resulting from
the Contractor’s refusal or failure to complete the work within the specified time, whether
or not the Contractor’s right to proceed with the work is terminated. This liability includes any
increased costs incurred by GDPM in completing the Work.

10.3.4. In accordance with the Ohio Revised Code, if GDPM intends to exercise its termination
right, GDPM shall issue not less than 5 days written notice (“5-Day Notice”) to the
Contractor and the Contractor’s Surety. However, notwithstanding any provision of the
Contract to the contrary, the issuance of the 5-Day Notice is not a condition precedent to
GDPM’s exercise of its rights and GDPM’s decision to not issue a 5-Day Notice will not

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prejudice GDPM's rights under this Contract.

10.3.5. If the Contractor fails to satisfy the requirements set forth in the 5-Day Notice within 15 days of receipt of the 5-Day Notice or as otherwise specified in the Notice, GDPM may declare the Contractor in default, terminate the Contract, and employ upon the Work the additional force or supply materials or either as appropriate, and remove Defective Work.

10.3.6. If, after termination of the Contractor's right to proceed, it is determined that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the Parties will be the same as if the termination had been for convenience of GDPM.

10.3.7. If the Contract is terminated, the Contractor's Surety may perform the Contract. Contractor and its Surety are subject to the following provisions and Contractor shall ensure the following provisions are contained within the Agreement between the Surety and Contractor regarding the Work that is the subject of this Contract.

10.3.7.1. If the Contractor's Surety does not commence performance of the Contract within 10 days of the date of Contract termination, GDPM may complete the Work by means that GDPM deems appropriate.

10.3.7.2. GDPM may take possession of and use all materials, facilities, and equipment at the Site or stored off-site, for which GDPM has paid.

10.3.7.3. If GDPM notifies the Contractor's Surety that the Contractor is in default or terminates the Contract, the Surety shall promptly and in not less than 21 days complete an investigation of the claimed material default or termination.

10.3.7.4. As part of such investigation, the Surety shall visit the offices of the Contractor, A/E and GDPM to review the available project records.

10.3.7.5. If the Surety proposes to take over the Work, the Surety shall do so no later than the expiration of such 21 day period or 10 days after the date GDPM terminates the Contract, whichever is later.

10.3.7.6. If GDPM terminates the Work, and the Surety proposes to provide a replacement contractor, the replacement contractor shall be fully capable of performing the Work in accordance with the Contract Documents, including meeting all the requirements of the Contract Documents. If the Contractor is terminated, the replacement contractor shall not be the Contractor.

10.3.7.7. The surety shall provide GDPM with the results of its investigation, including any written report or documents.

10.3.7.8. Termination for Cause/Default is in addition to GDPM's other rights under the Contract Documents and is not intended to create any rights of the Surety, including but not limited to the right to take over the Contractor's obligations.

10.3.7.9. If the Contract is terminated for cause, the Contractor shall not be entitled to further payment. If the unpaid balance of the Contract Sum exceeds the costs of finishing the Work, including without limitation the fees and charges of engineers, architects, attorneys, and other professionals and court costs, and other damages incurred by GDPM and not expressly waived, the Contractor or Surety shall immediately pay the amount of insufficiency to GDPM.

10.3.7.9.1. This obligation for payment shall survive termination of the Contract.

10.3.7.10. If the Contractor's Surety performs the Work, the provisions of the Contract Documents govern the Surety's performance, with the Surety in place of Contractor
in all provisions including, but not limited to, provisions for payment for the Work, and provisions of the right of GDPM to complete the Work.

10.4. If GDPM terminates the Contract, the termination shall not affect any rights or remedies of GDPM against the Contractor then existing or which may thereafter accrue.

10.5. GDPM’s retention or payment of funds due to the Contractor shall not release the Contractor or the Contractor’s Surety from liability for performance of the Work in accordance with the Contract Documents.

10.6. **Contractor Insolvency**

10.6.1. **Bankruptcy of Contractor:** If the Contractor files a voluntary petition in bankruptcy or has an involuntary petition in bankruptcy filed against it, the Contractor, the Contractor as the debtor-in-possession, or the trustee of the Contractor’s bankruptcy estate shall notify GDPM in writing within 5 days of such filing and file a motion to assume or reject the Contract within 20 days after the filing of the petition and shall diligently prosecute that motion to conclusion so as to obtain an order granting or denying that motion within 45 days after the filing of the petition.

- The failure to file and prosecute that motion Contractor shall constitute a material breach of the Contract as time is of the essence with respect to Contractor’s performance of all terms of this Contract.
- The Contractor agrees to the granting of relief from the automatic stay of the Bankruptcy Code, to permit GDPM to terminate the Contract for cause in such instance and issue and serve all notices necessary to terminate the Contract or arising out of termination of the Contract and to take any other action necessary to terminate the Contract.

10.6.2. **Receivership or Assignment for the Benefit of Creditors:** If the Contractor makes a general assignment for the benefit of creditors or if a receiver is appointed for all or a substantial part of Contractor’s business or property, GDPM shall serve written notice to the Contractor and Contractor’s Surety stating that any failure of the Contractor to provide adequate assurance of continued performance shall be considered a rejection of the Contract, which shall result in termination of the Contract for cause.

- Such termination of the Contract need not be evidenced by an order of any court

10.7. A Contractor’s right to Proceed shall not be terminated for Cause or the Contractor charged with damages under this the Provisions for Termination for Cause/Default as set forth above if:

10.7.1. The delay in completing the Work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such causes include:

1. Acts of God, or of the public enemy;
2. Acts of GDPM or other governmental entity in either its sovereign or contractual capacity,
3. Acts of another contractor in the performance of contract with GDPM;
4. Fire;
5. Floods;
6. Epidemics;
7. Quarantine restrictions;
8. Strikes;
9. Freight embargos;
10. Unusually severe weather; or
11. As determined by GDPM, delays of subcontractors or suppliers at any tier arising from unforeseeable causes beyond the control and without the fault or negligence of either the Contractor or Subcontractors and suppliers.

10.7.2. The Contractor, within 10 days from the beginning of such delay as set forth in this Provision, unless otherwise extended by GDPM, shall notify GDPM in writing of the causes of delay.

10.7.3. GDPM's Contracting Officer shall ascertain the facts and extent of the delay.

10.7.4. If in the judgment of GDPM's Contracting Officer, the findings of fact warrant such action, time for completing the Work shall be extended by written modification to the Contract. The findings of fact of the Contracting Officer shall be reduced to a written decision which shall be subject to the provisions of the Article titled Dispute Resolution and Claim Procedure.

11 ARTICLE XI: CONSTRUCTION CLOSEOUT

11.1. Final Cleaning

11.1.1. Before requesting the Substantial Completion inspection of the Work, the Contractor shall clean the Site, remove waste materials and rubbish attributable to the Project, and restore the property to an acceptable condition so that upon Substantial Completion, the premises site is ready for occupancy by GDPM.

11.1.2. If the Contractor performs any Work after final cleaning, the Contractor shall clean the affected area as provided above so that upon Substantial Completion, the premises site is ready for occupancy by GDPM.

11.1.3. Final cleaning shall be done to the reasonable satisfaction of GDPM.

11.1. Inspection and Construction of the Work

11.1.1. The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the Work performed under the Contract conforms to all Contract requirements.

11.1.2. All Work is subject to GDPM inspection and test at all places and at all reasonable times before acceptance to ensure strict compliance with the terms of the Contract.

11.1.3. GDPM inspections and tests are for the sole benefit of GDPM and shall not:

- Relieve the Contractor of responsibility for providing adequate quality control measures;
- Relieve the Contractor of responsibility for loss or damage of the material before acceptance;
- Constitute or imply acceptance; or
- Affect the continuing rights of GDPM after acceptance of the completed work.

11.1.4. The presence or absence of the GDPM inspector does not relieve the Contractor from any Contract requirement. And, the inspector is not authorized to change any term or condition of the specifications without the Contracting Officer's written authorization.

11.1.5. All instructions and approvals with respect to the work shall be given to the Contractor by
GDPM and shall be in writing.

11.1.6. The Contractor shall promptly furnish, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by GDPM.

11.1.7. GDPM may charge to the Contractor any additional cost of inspection or test when work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes re-inspection or retest necessary.

11.1.8. GDPM shall perform all inspections and tests in a manner that will not unnecessarily delay the work. Special, full size and performance tests shall be performed as described in the Contract Documents.

11.2. **Routine Inspections**

11.2.1. At its discretion, GDPM may conduct routine inspections of the construction Site on a daily basis.

11.2.2. The Contractor shall, without charge, replace or correct Work found by GDPM not to conform to contract requirements, unless GDPM decides that it is in its interest to accept the Work with an appropriate adjustment in Contract Sum.

11.2.3. The Contractor shall promptly segregate and remove rejected material from the premises.

11.2.4. If the Contractor does not promptly replace or correct rejected Work, GDPM may:

   11.3.4.1. By Contract or otherwise, replace or correct the Work and charge the cost to the Contractor; or

   11.3.4.2. Terminate for default the Contractor’s right to proceed.

11.2.5. If any work requiring inspection is covered up without approval of GDPM, it must, if requested by GDPM, be uncovered at the expense of the Contractor.

11.2.6. If at any time before final acceptance of the all Work, GDPM considers it necessary or advisable, to examine Work already completed by removing or tearing it out, the Contractor, shall on request, promptly furnish all necessary facilities, labor, and material.

- If such Work is found to be defective or nonconforming in any material respect due to the fault of the Contractor or its subcontractors, the Contractor shall defray all the expenses of the examination and of satisfactory reconstruction.

- If, however, such Work is found to meet the requirements of the Contract, GDPM shall make an equitable adjustment to cover the cost of the examination and reconstruction, including, if completion of the Work was thereby delayed, an extension of time.

11.3. **Substantial Completion**

11.3.1. **Contractor’s Punch List**

1. When the Contractor considers the Work, or a designated portion thereof, Substantially Complete, the Contractor shall inspect the Work and prepare a list of Defective Work and incomplete or unacceptable Work ("Contractor’s Punch List").

2. The Contractor shall list all items of Work not in compliance with the Contract Documents, including items the Contractor is requesting to be deferred.

3. The Contractor shall proceed to correct all items listed on the Contractor’s Punch List
and certify that the incomplete items listed on the Contractor’s Punch List are to its knowledge an accurate and complete list by signing the Contractor’s Punch List.

4. The Contractor’s failure to include an item on the Contractor’s Punch List shall not alter the Contractor's responsibility to complete the Work in accordance with the Contract Documents.

5. The Contractor shall submit the signed Contractor’s Punch List to GDPM together with a request for a Substantial Completion inspection of the Work.

11.3.2. **Substantial Completion Inspection**

1. The Contractor shall notify GDPM, in writing, as to the date when, in its opinion, all or a designated portion of the Work will be substantially completed and ready for inspection.

2. If GDPM and/or the A/E determine that the state of preparedness is as represented, GDPM will promptly arrange for the inspection.

3. Unless otherwise specified in the Contract, GDPM shall accept, as soon as practicable after completion and inspection, all work required by the Contract or that portion of the Work that GDPM determines and designates can be accepted separately.

4. Acceptance shall be final and conclusive except for latent defects, fraud, gross mistakes amounting to fraud, or GDPM’s right under any warranty or guarantee.

5. Within 3 business days after receipt of the request for the Substantial Completion inspection of the Work, GDPM shall notify the Contractor of acceptance or rejection of the request, stating reasons for any rejection.

6. Within 7 days after its acceptance of the Contractor’s request, GDPM and/or the A/E shall conduct the Substantial Completion inspection to determine whether the Work, or designated portion, is in conformity with the Contract Documents and Substantially Complete.

7. If GDPM and/or the A/E determines that the Work is Substantially Complete, within 3 business days after the Substantial Completion inspection, GDPM and/or the A/E shall prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion and include a list of Defective, incomplete, or unacceptable Work ("GDPM’s Punch List").

8. GDPM’s Punch List shall include:
   - The items on the Contractor's Punch List that are not yet completed or corrected as of the date of the Substantial Completion inspection; and
   - Comments from GDPM.

11.3.3. GDPM shall submit the Certificate of Substantial Completion to the Contractor for their written acceptance.

11.3.4. Upon their acceptance and consent of the Contractor's Surety, and subject to GDPM’s right to withhold payment, GDPM shall release retainage.

11.3.5. GDPM and/or the A/E’s failure to include an item on GDPM’s Punch List shall not alter the Contractor’s responsibility to complete the Work in accordance with the Contract Documents.

11.3.6. If GDPM subsequently determines that the Work is not Substantially Complete, GDPM
may request compensation for related expenses.

- GDPM may deduct the additional expenses from payments then or thereafter due to the Contractor.
- If payments then or thereafter due to the Contractor are not sufficient to cover those amounts, the Contractor shall immediately pay the amount of the insufficiency to GDPM.

### 11.3.7. Completion of Punch List Items

1. The Contractor shall complete all items on GDPM’s Punch List prior to date of Final Contract Completion.
2. After completing all items on GDPM's Punch List, the Contractor shall provide a written request for Final Inspection of the Work.
3. If Work on the Punch List cannot be timely completed, the Contractor shall submit a change order in accordance with the provisions of this Contract.
4. Within 3 business days after receipt of the request for the Final Inspection of the Work, GDPM and/or the A/E shall complete a Final Inspection of the Work for compliance with the Contract Documents.
5. If multiple inspections of items on GDPM's Punch List are required due to the Contractor's failure to properly and timely complete them, the Contractor shall pay any additional costs incurred by the A/E and GDPM resulting from any attendant delay.
6. GDPM may deduct those additional costs from payments then or thereafter due to the Contractor. If payments then or thereafter due to the Contractor are not sufficient to cover those amounts, the Contractor shall immediately pay the amount of the insufficiency to GDPM.

### 11.4. Demonstration and Training, Operating Appurtenances

11.4.1. The Contractor, as a condition precedent to execution of the Certificate of Contract Completion and final payment, shall perform demonstration and training of GDPM's maintenance staff and other staff as requested by GDPM.

11.4.2. The Contractor, as a condition precedent to execution of the Certificate of Contract Completion and final payment, shall organize and submit operating appurtenances and loose items related to operation and maintenance of the completed Project to GDPM, including, but not limited to:

- Keys to door and window hardware, panels, and other devices not directly provided to GDPM from the manufacturer;
- Operating handles, levers, cranks, specialized wrenches or drivers, remote controls, and similar items; and
- Extra materials (e.g., attic stock).

### 11.5. Acceptance of Defective Work

11.5.1. Defective Work may only be knowingly accepted by GDPM in writing instead of GDPM requiring its removal or correction, in which case the Contract Sum must be equitably reduced to account for the reduction in benefit of the Work received by GDPM on account of the Defective Work.

11.5.2. GDPM may only accept Defective Work though a deduct Change Order that makes
explicit reference to Acceptance of Defective Work

11.5.3. None of the following will constitute acceptance of Defective Work, a release of the Contractor’s obligation to perform the Work in accordance with the Contract, or a waiver of any rights set forth in the Contract or otherwise provided by Applicable Law:

1. Observations or inspections by GDPM or the A/E;
2. The making of any payment;
3. Substantial Completion or the issuance of a Certificate of Substantial Completion;
4. Partial Occupancy and GDPM’s use or occupancy of the Work or any part of it;
5. Contract Completion or the issuance of a partial or final Certificate of Contract Completion;
6. Any review or approval of a submittal;
7. Any inspection, test, or approval by other Persons; or
8. Any correction of Defective Work by GDPM.

11.6. Building Commissioning

11.6.1. If the Project scope includes building commissioning, the Contractor shall participate in the Commissioning Process, as prescribed in the Contract Documents.

11.6.2. The Contractor shall permit the A/E, GDPM, or a third-party Commissioning Agent ("CxA") if applicable, access to commission performance based equipment, fixtures, and/or systems (e.g., HVAC, fire protection, smoke evacuation, fume hoods, emergency power, etc.), prior to Substantial Completion.

11.6.3. The A/E, GDPM, or CxA, if applicable, shall promptly notify, in writing, the Contractor of any deficiency identified during the Commissioning Process.

11.6.4. To facilitate the Commissioning Process, the Contractor shall submit 4 sets of Operation and Maintenance manuals for dynamic and engineered systems to GDPM and CxA, if applicable, for approval. This submission shall occur within 30 days of obtaining approval of all related Contractor submittals required by the Contract Documents.

11.7. Partial Contract Completion

11.7.1. When items of Work cannot be completed until a subsequent date, GDPM shall prepare a partial Certificate of Contract Completion that shall include a detailed list of the deferred Work and the date(s) by which the Contractor will complete that Work.

11.7.2. GDPM shall submit the partial Certificate of Contract Completion to Contractor for their written acceptance. Upon their acceptance of the partial Certificate of Contract Completion and consent of the Contractor’s Surety, GDPM may release payment to the Contractor, as determined in the sole discretion of GDPM.

11.8. Final Contract Completion

11.8.1. When all items on GDPM’s Punch List have been completed to the satisfaction of GDPM, all requirements of the Contract Documents have been completed, and the provisions have been fulfilled, GDPM shall prepare and recommend execution of final Contract payment.

11.8.2. The date that GDPM executes the final Contract payment is the date of Contract Completion.
11.8.3. Nothing in Contract Completion shall constitute a waiver of GDPM's ability to pursue damages as the result of any breach of the Contract by the Contractor or Liquidated Damages.

11.9. **Partial Occupancy**: if the building authority with jurisdiction over the project issues a partial certificate of occupancy, GDPM may occupy or use a portion of the Project prior to Contract Completion. The Contractor shall be relieved of the obligation to maintain the area accepted for partial Occupancy, but shall remain obligated to complete and correct the Work and to carry insurance as required by the Contract Documents during performance of any such Work.

12. **Article XII: Warranty**

12.1. **Warranty of Title**: Contractor warrants good title to all materials, supplies, and equipment incorporated in the Work and agrees to deliver the premises together with all improvements thereon free from any claims, liens or charges, and agrees further that neither it nor any other person, firm or corporation shall have any right to a lien upon the premises or anything appurtenant thereto.

12.2. **Warranty of Construction**

12.2.1. Contractor warrants to GDPM that all materials and equipment furnished under this Contract shall be new and of good quality unless otherwise required or permitted by the Contract Documents. In addition, Contractor warrants that work performed under this Contract conforms to the contract requirements and is free of any defect in equipment, material, or workmanship performed by Contractor or any subcontractor or supplier at any tier.

a. This warranty shall continue for a period of one-year from the date of final acceptance of the Work.

b. If GDPM takes possession of any part of the Work prior to final acceptance, this warranty shall continue for a period of one year from the date GDPM takes possession.

c. Work not conforming to the requirements, including Substitutions not properly approved and authorized, may be considered Defective Work.

d. If Contractor or a Subcontractor recommends a particular product, material, system, or item of equipment for incorporation into the Project and GDPM accepts that recommendation, the above warranty includes a warranty from Contractor to GDPM that the recommended product, material, system, or item of equipment is fit and appropriate for the associated purpose.

e. If required by GDPM, Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

12.2.2. Contractor shall remedy, at Contractor's expense, any failure to conform, or any defect. Further, Contractor shall remedy, at Contractor's expense, any damage to GDPM-owned or controlled real or personal property when the damage is the result of: (1) Contractor's failure to conform to contract requirements; or (2) any defects of equipment, material, workmanship or design furnished by Contractor.

12.2.3. Contractor shall restore any work damaged in fulfilling the terms and conditions of Warranty of Construction. Contractor's warranty with respect to work repaired or replaced will run for not less than one year of repair or replacement.

12.2.4. GDPM shall notify Contractor, in writing, within a reasonable time after the discovery of
any failure, defect or damage. If Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, GDPM shall have the right to replace, repair or otherwise remedy the failure, defect, or damage at Contractor's expense.

12.2.5. With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, Contractor shall:
   a. Obtain all warranties that would be given in normal commercial practice;
   b. Require all warranties to be executed in writing, for the benefit of GDPM; and
   c. Enforce all warranties for the benefit of GDPM.

12.2.6. In the event Contractor's warranty under this provision has expired, GDPM may bring suit to enforce a subcontractor's or manufacturer's or supplier's warranty.

12.2.7. Unless a defect is caused by the negligence of the Contractor or its subcontractor or supplier at any tier, Contractor shall not be liable for the repair or defect of material or design furnished by GDPM or for the repair of any damage that results from any defect in GDPM furnished material or design.

12.2.8. Notwithstanding any provisions herein to the contrary, the establishment of time periods in this Article relate only to the specific obligation of the Contractor to correct the work and have no relationship to the time within which its obligation to comply with the contract may be sought to be enforced, or to the time within which proceedings may be commenced to establish Contractor's liability with respect to its obligations other than specifically to correct the work.

12.2.9. This Warranty shall not limit GDPM's rights under the Inspection and Acceptance of Construction related provisions within this Contract with respect to latent defects, gross negligence or fraud.

12.3. Warranty Walk-through Contractor: At GDPM's request, Contractor shall perform a walkthrough of the property no earlier than three months prior to the expiration of any Warranty. If Contractor is unavailable for the warranty walk-thru, the warranty shall be extended until the time Contractor is available.

12.4. All warranties, including but not limited to, material, equipment and special warranties and warranties otherwise required by the Contract Documents shall be issued in the name of GDPM, or shall be transferrable to GDPM and shall commence, unless otherwise indicated in the Contract Documents, upon issuance of certification of substantial completion.

13. Article XII: Bonds and Insurance

13.1. Bid Bond/Guaranty

13.1.1. The Contractor shall provide to GDPM a bid guaranty in the form of either: (1) a bond for 10% of the bid; or (2) a certified check, cashier's check or letter of credit revocable only at the option of GDPM and shall be in the amount of 10% of the bid.

13.1.2. The bid guaranty shall be conditioned to provide that Contractor will, after award, enter into a contract with GDPM in accordance with the bid, plans, details, and specifications.
13.1.3. If the bidder fails to enter into the Contract and GDPM awards Contract to next lowest bidder, the bidder and the surety on the bidder's bid are liable to GDPM for the lessor of either:

- The difference between the bid and that of the next lowest bidder; or
- For a penal sum in the amount of 10% of the bid.

13.1.4. If GDPM does not award the Contract to the next lowest bidder but resubmits the Project for bidding, the bidder failing to enter into the Contract and the surety on the bidder's bond are liable to GDPM for a penal sum not to exceed 10% of the amount of the bid.

13.1.5. Where GDPM accepts a bid but the bidder fails or refuses to enter into a proper contract in accordance with the bid, plans, details, and specifications within ten days after Notice of Intent, the bidder and surety on any bond are liable for the amount of the difference between the bidder's bid and the next lowest bidder.

13.1.6. All bid guaranties shall be payable to GDPM, be for the benefit of GDPM and be deposited with GDPM.

13.2. Payment and Performance Bond

13.2.1. Contract Commencement does not occur until GDPM receives a Payment and Performance Bond

13.2.2. Contractor must, within 10 days of GDPM's delivery of signed Contract to Contractor, unless otherwise specified by GDPM in writing, deliver to GDPM a payment and performance bond with a penal sum in the amount of 100% of the Contract Sum (which includes all acceptable alternates).

13.2.3. The payment and performance bond must contain a condition that indemnifies GDPM against all damages suffered by Contractor's failure to perform the Contract according to the provisions and in accordance with the plans, details, and specifications and to pay all lawful claims of subcontractors, material suppliers, and laborers for labor performed or material furnished in carrying forward, performing or completing the Contract.

13.2.4. The bond shall be obtained from companies holding certificates of authority as acceptable sureties and shall be listed on the U.S. Treasury Circular 570 (T-List).

13.2.4.1. Each company shall be licensed to do business in Ohio and satisfactory to GDPM.

13.2.5. The Contractor shall submit with the executed Bond:

13.2.5.1. A certified copy of the authority to act (power of attorney) of the agent signing the Bond on behalf of the Surety, and

13.2.5.2. A current signed Certificate of Compliance issued by the Ohio Department of Insurance demonstrating that Surety is licensed to do business in Ohio.

13.2.6. If the Contract Sum increases at any time such that it exceeds the sum of the Bond, the Contractor shall cause the penal sum of the Bond to be increased such that the sum equals one-hundred percent (100%) of the increased Contract Sum.

13.2.7. Any time Contractor increases the sum of the Bond, the Contractor shall deliver to GDPM written consent of the affected Surety confirming the increased sum. GDPM's receipt of that written consent is a condition precedent to GDPM's obligation to pay the Contractor for any portion of the Work associated with the increase.

13.2.8. If notice of any change affecting the Contract is required by any Surety or by the provision of any Bond, the Contractor shall provide that notice.
13.3. **Form of Bond:** All bonds and guarantees must be provided for on a form deemed acceptable by GDPM and must be drafted and executed in accordance with all HUD and State of Ohio requirements. Unless otherwise so indicated, Contractor shall use GDPM's Bond Forms.

13.4. **General Insurance Requirements**

13.4.1. Prior to commencing Work, Contractor and each subcontractor shall furnish GDPM with certificates of insurance demonstrating coverage that meets the Minimum Contractor Coverage Requirements as outlined below is in full force and will insure all operations under the Contract.

13.4.2. Throughout the performance of the Work or longer as may be described below, Contractor and each Subcontractor shall obtain, pay for and keep in force, the minimum insurance coverage.

13.4.3. On a case-by-case basis, GDPM and Contractor may agree to adjust the below requirements for any particular subcontractor.

13.4.4. All insurance shall be carried with companies which are financially responsible and admitted to do business in the State of Ohio.

13.4.5. If any such insurance is due to expire during the construction period, Contractor (including subcontractors, as applicable) shall not permit the coverage to lapse and shall furnish evidence of coverage to GDPM.

13.4.6. All certificates of insurance, as evidence of coverage, shall provide that no coverage may be canceled or non-renewed by the insurance company until at least 30 days prior written notice has been given to GDPM.

13.5. **Minimum Contractor Coverage Requirements**

13.5.1. **Workers' Compensation:** The amount of Workers' Compensation coverage shall be in accordance with the State of Ohio Workers' Compensation laws.

13.5.2. **Commercial General Liability:** With a combined single limit for bodily injury and property damage of not less than $1,000,000 per occurrence unless otherwise specified by GDPM in writing, to protect Contractor and each subcontractor against claims for bodily injury or death and damage to the property of others. This shall cover the use of all equipment, hoists, and vehicles on the site(s) not covered by Automobile Liability.

13.5.2.1. If Contractor has a "claims made" policy, then the following additional requirements apply: (1) the policy must provide a "retroactive date" which must be on or before the execution date of the Contract; and (2) the extended reporting period may not be less than five years following the completion date of the Contract.

13.5.3. **Employers Liability Coverage:** Unless otherwise specified by GDPM in writing, Contractor shall maintain employer's liability coverage with:

13.5.3.1. An each accident limit of not less than $1,000,000;

13.5.3.2. A disease each-employee limit of not less than $1,000,000; and

13.5.3.3. A disease policy limit of not less than $1,000,000.

13.5.4. **Automobile Liability:** On owned and non-owned motor vehicles used on the site(s) or in connection therewith for a combined single limit for bodily injury and property damage of not less than $1,000,000 per occurrence.
13.5.5. **Builder’s Risk Insurance:** Before commencing Work, Contractor shall furnish GDPM with a certificate of insurance evidencing that Builder's Risk (fire and extended coverage) Insurance on all work in place and/or materials stored at the building site(s), including foundations and building equipment, is in force.

13.5.5.1. The Builder's Risk Insurance shall be for the benefit of the Contractor and GDPM as their interests may appear and each shall be named in the policy or policies as an insured.

13.5.5.2. If installing equipment supplied by GDPM, Contractor shall carry insurance on such equipment from the time Contractor takes possession thereof until the Contract work is accepted by GDPM.

13.5.5.3. The Builder’s Risk Insurance need not be carried on excavations, piers, footings, or foundations until such time as work on the superstructure is started. Builder's Risk coverage need not be carried on landscape work.

13.5.5.4. Policies shall furnish coverage at all times for the full cash value of all completed construction, as well as materials in place and/or stored at the site(s), whether or not partial payment has been made by GDPM.

13.5.5.5. Contractor may terminate this insurance on buildings as of the date taken over for occupancy by GDPM.

13.5.5.6. The amount of Builder's Risk coverage shall not be less than the total completed value of the Project, including the value of permanent fixtures and decorations, with a deductible of not more than $25,000 per occurrence. Any deductible over the amount specified in this provision shall be authorized in writing by GDPM.

13.5.5.7. Coverage shall include a provision to pay the reasonable extra costs of acceleration and expediting temporary and permanent repairs to, or permanent replacement of, damaged property.

13.5.5.8. This shall include overtime wages and the extra costs of "express" or other means of expedited transportation and/or delivery of supplies necessary to the repair of replacement.

13.5.5.9. Coverage shall include "soft costs endorsement" including, but not limited to, the reasonable extra costs of the A/E and reasonable Contractor extension or acceleration costs.

13.5.5.10. Coverage shall include material in transit or stored in off-site and identified for the Project.

13.5.5.11. Coverage shall waive all rights between GDPM, Contractor, and Subcontractors at any tier, for damages caused by fire or any other perils to the extent of actual recovery of any insurance proceeds under the policy.

13.5.5.12. Coverage shall include appropriate sub-limits for installation coverage.

13.5.5.13. Coverage shall include provisions for mechanical or electrical breakdown, or boiler system testing.

13.5.5.14. Coverage shall include temporary structures and scaffolding, along with collapse coverage.

13.5.5.15. Coverage shall be primary to all other applicable insurance.
13.5.5.16. The builder's risk policy shall specifically permit partial occupancy by GDPM prior to Contract Completion and coverage shall remain in effect until all punch items are completed.

13.5.5.17. The Contractor's tools and equipment shall not be covered under the builder's risk policy. It is the Contractor's sole responsibility to maintain such coverage, which shall be included in its Overhead (a component of Contractor's Fee) and not included as a separate item in Contractor's Schedule of Values.

13.5.5.18. If Contractor is involved solely in the installation of material and equipment and not in new building construction, Contractor shall purchase and maintain a builder's risk, builder's risk-renovations, or installation floater insurance policy that complies with this Provision.

13.5.6. Umbrella/Excess Liability: Contractor may employ an umbrella/excess liability policy to achieve the above required minimum coverage. Unless otherwise specified by GDPM in writing, for Construction Contracts in excess $1,000,000, the Contractor shall maintain umbrella/excess liability coverage with a limit of not less than $2,000,000 (in addition to the above-required limits) if the Work (or Work to be performed by the Subcontractor) includes any of the following:

   a. Brick/block masonry;
   b. Exterior caulking/sealant;
   c. Cast-in-place or precast concrete;
   d. Damp proofing/waterproofing;
   e. Electrical;
   f. Elevator;
   g. Exterior glass and/or glazing;
   h. Exterior marble, granite, and/or other stonework;
   i. Miscellaneous metals;
   j. Plaster/stucco;
   k. Plumbing;
   l. HVAC;
   m. Roofing and/or sheet metal;
   n. Scaffolding;
   o. Spray-on fireproofing;
   p. Sprinkler and/or fire protection; or
   q. Structural steel and/or metal deck.

13.5.7. Unless otherwise specified by GDPM in writing, Contractor shall maintain umbrella/excess liability coverage with a limit of not less than $5,000,000 (in addition to the above-required limits) if the Work (or Work to be performed by the Subcontractor) includes any of the following:

   a. Caissons and/or piles;
   b. Major Demolition;
c. Excavation and/or utility work;
d. Sheetimg, shoring, and/or underpinning;
e. Window washing equipment; or
f. Wrecking.

13.5.8. Professional Liability: Unless otherwise specified by GDPM in writing, Contractor shall maintain professional liability insurance (including without limitation for sprinkler and/or fire protection and other design-build work included in the Work) without design-build exclusions with a limit not less than $1,000,000 each claim and an annual-aggregate limit of not less than $2,000,000.

13.5.8.1. The professional liability policy shall have an effective date on or before the date that Contractor first started to provide any Project-related services.

13.5.8.2. Upon submission of the associated certificate of insurance and at each policy renewal, the Contractor shall advise GDPM in writing of any actual or alleged claims that may erode the professional liability limits.

13.5.8.3. Contractor shall maintain the professional liability insurance in effect for no less than 5 years after the earlier of the termination of the Contract or Substantial Completion of all Work.

13.5.9. Additional Property Insurance: For any demolition, blasting, excavating, tunneling, shoring, or similar operations, the Contractor shall provide and maintain Property Damage Liability insurance with a limit of liability equal to the limit as specified in the applicable provisions of this Article.

13.5.10. Equipment Coverage:

13.5.10.1. GDPM will not insure or be liable for damage to any Contractor or Subcontractor owned, leased, rented, or borrowed tools, equipment, or vehicles.

13.5.10.2. Contractor and Subcontractors are solely responsible for maintaining all insurance necessary to cover their tools, equipment, and vehicles.

13.5.11. Pollution Coverage: Contractor shall maintain Pollution Liability Insurance, including Asbestos Liability Insurance, covering liability for bodily injury, property damage, and environmental damage resulting from "sudden accidental" or "gradual" pollution and related cleanup costs incurred by the Contractor, all arising out of the Work to be performed under this contract. Combined single limit per occurrence shall not be less than $500,000, or the equivalent. Annual aggregate limit shall not be less than $1,000,000.

13.6. Waivers of Subrogation

13.6.1. To the fullest extent permitted by Applicable Law, Contractor waives all rights against GDPM and its agents and employees for damages to the extent covered by any insurance, except rights to the proceeds of that insurance.

13.6.2. All policies shall accomplish the waiver of subrogation by endorsement or otherwise.

13.6.3. GDPM and Contractor waive all rights against each other for damages caused by fire or other perils to the extent actual recovery of any insurance proceeds under any property insurance or builder's risk insurance applicable to the Work.
14. **Article XIV: Indemnification**

14.1. To the fullest extent permitted by federal and State Law, Contractor shall indemnify, defend, and hold harmless the Indemnified Parties from and against all claims, costs, damages, losses, fines, penalties, and expenses (including but not limited to all fees and charges of attorneys and other professionals, and all court, arbitration, or other dispute-resolution costs) arising out of or in connection with the Project.

14.2. The Contractor shall be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence, and shall take proper safety and health precautions to protect the Work, the workers, the public, and the property of others. Contractor shall hold and save GDPM, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.

14.3. Contractor's indemnification obligations under this Article exists regardless of whether or not and the extent to which the claim, damage, loss, fine, penalty, or expense is caused by a party indemnified pursuant to this Article.

14.4. Nothing in this Article obligates Contractor to indemnify any individual or entity from and against the consequences of that individual or entity's own negligence.

14.5. Contractor's obligations under this Article shall not extend to the liability of the A/E, A/E's consultants, agents, representatives, or employees for negligent preparation or approval of Drawings, Specifications, Change Orders, opinions, and other responsibility of the A/E, except to the extent covered by Contractor's insurance.

14.6. In claims against an Indemnified Party by any direct or indirect employee (or the survivor or personal representative of that employee) of the Contractor or a person or entity for whom the Contractor may be liable, the indemnification obligations under this Article will not be limited by a limitation on the amount or type of damages, compensation, or benefits payable under workers' compensation acts, disability benefit acts, or other employee benefits acts.

14.7. Contractor's indemnification obligation under this Article will survive termination of the Contract and Contract Completion.

14.8. GDPM may deduct, from the Contract Sum, the claims, losses, fines, penalties, and expenses for which Contractor is liable under this Article.

14.9. If those claims, damages, losses, fines, penalties and expenses exceed the unpaid balance of the Contract Sum, Contractor shall immediately pay the difference to GDPM.

15. **Article XV: Damages**

15.1. **Liquidated Damages**

15.1.1. If Contractor fails to complete the work within the time specified in the contract, or any extension, the Contractor shall pay to GDPM as liquidated damages in accordance with the table below.

15.1.1.1. If different completion dates are specified in the contract for separate parts or stages of the work, the amount of liquidated damages shall be assessed on those parts or stages which are delayed.

15.1.1.2. To the extent that Contractor's delay or nonperformance is excused under another clause in this contract, liquidated damages shall not be due GDPM.

15.1.1.3. Contractor remains liable for damages caused other than by delay.
15.1.2. If GDPM terminates Contractor's right to proceed, the resulting damage will consist of liquidated damages until such reasonable time as may be required for final completion of the work together with any increased costs occasioned GDPM in completing the work.

15.1.3. If GDPM does not terminate Contractor's right to proceed, the resulting damage will consist of liquidated damages until the work is completed or accepted.

15.1.4. If Contractor fails to achieve a Milestone within the associated Contract Time, it would be difficult, if not impossible, to determine GDPM's resulting damages.

15.1.5. Therefore, if the Contractor fails to achieve a Milestone within the associated Contract Time, the Contractor shall (at GDPM's option) pay to or credit GDPM the Liquidated Damages per day sum determined according to the following schedule for each day that the Contractor fails to achieve a Milestone within the associated Contract Time.

<table>
<thead>
<tr>
<th>Total Contract Sum</th>
<th>Daily Liquidated Damages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than $150,000</td>
<td>$200</td>
</tr>
<tr>
<td>$150,000-$500,000</td>
<td>$400</td>
</tr>
<tr>
<td>$500,000.01 - $1,000,000</td>
<td>$500</td>
</tr>
<tr>
<td>$1,000,000.01 - $2,000,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>More than $2,000,000</td>
<td>$2,000</td>
</tr>
</tbody>
</table>

15.1.6. If Contractor simultaneously fails to achieve two or more Milestones, GDPM shall be entitled to recover the sum of the associated Liquidated Damages per day rates.

15.1.7. The Liquidated Damages described are only intended to compensate GDPM for the direct damages it incurs as a result of Contractor's failure to achieve the Milestones within their associated Contract Times.

15.1.8. The Liquidated Damages described are not intended to compensate GDPM for any damages GDPM incurs on account of:

15.1.8.1. Any claims attributable to Contractor that are brought by others including Separate Consultants and Separate Contractors; or

15.1.8.2. Any failure of Contractor to timely, properly, and completely perform the Contract other than the failure to achieve the Milestones within their associated Contract Times.

15.1.9. The parties acknowledge that the above-listed Liquidated Damages per day sums are not penalties, and they each irrevocably waive the right (if any) to challenge the validity and enforceability of those Liquidated Damages per day sums.

15.1.9.1. Notwithstanding any other provision of the Contract Documents to the contrary, if a court determines that the Liquidated Damages per day sums or their application are void and unenforceable, GDPM shall be entitled to recover the actual damages that it incurs on account of the Contractor's failure to achieve one or more of the Milestones within the Contract Times.

15.1.10. In addition to other rights that GDPM may have relative to the Liquidated Damages, GDPM may deduct the Liquidated Damages from the Contract Sum as the damages accrue. If payments then or thereafter due to the Contractor are not sufficient to cover such amounts, Contractor shall immediately pay the amount of the insufficiency to
15.2. Mutual Waiver of Consequential Damages

15.2.1. Except for the Liquidated Damages provided for above, GDPM and Contractor each waive against the other all Claims for consequential damages that may arise out of or relate to this Contract.

15.2.1.1. GDPM's waiver includes Claims for loss of use, income, profit, revenue, financing, cost of capital, business and reputation, management and employee productivity, and consequential damages arising from termination of the Contract or related to insolvency.

15.2.1.2. The Contractor's waiver includes:

- 15.2.1.2.1. Claims for unabsorbed home-office overhead;
- 15.2.1.2.2. Any other form of overhead in excess of that specifically provided for; 15.2.1.2.3. Delay damages except as otherwise specifically provided for; 15.2.1.2.4. Increased cost of funds for the Project;
- 15.2.1.2.5. Lost opportunity to work on other projects;
- 15.2.1.2.6. Losses of financing, business, and reputation;
- 15.2.1.2.7. Loss of profit except anticipated profit, arising directly from properly performed Work;
- 15.2.1.2.8. Loss of bonding capacity; and
- 15.2.1.2.9. Consequential damages arising from termination of the Contract or related to insolvency.

15.2.2. Notwithstanding Section 15.2.1, this Section 15.2:

- 15.2.2.1. Does not apply to any damages that would be covered by insurance provided in connection with the Project if the Contract did not include Section 15.2.1;
- 15.2.2.2. Does not apply to Contractor's indemnity obligations for third-party claims against the Indemnified Parties even if those claims are for damages that Section 15.2.1 would otherwise preclude;
- 15.2.2.3. Does not preclude GDPM's recovery of Liquidated Damages; and
- 15.2.2.4. Does not apply to Claims for damages arising from GDPM's or Contractor's gross negligence or willful misconduct.

15.3. This Article 15 shall survive termination of the Contract.

16 Article XVI: Labor Standards Davis-Bacon and Related Acts

16.1.1. All rulings and interpretations of the Davis Bacon and Related Acts contained in 29 CFR Part 3 are herein incorporated by reference in this Contract.

16.2. Minimum Wages

16.2.1. All laborers and mechanics employed under this Contract in the development or construction of the project(s) involved will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the
Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which shall be attached to the Contract Documents and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics.

16.2.2. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the regular weekly period, are deemed to be constructively made or incurred during such weekly period.

16.2.3. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits in the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4).

16.2.4. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein; provided that the employer's payroll records accurately set forth the time spent in each classification in which work is performed.

16.2.5. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5 and the Davis-Bacon poster (WH-1321)) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

16.2.6. Any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination.

16.2.7. HUD shall approve any additional classification and wage rate and fringe benefits therefor only when all the following criteria have been met:

16.2.7.1. The work to be performed by the classification requested is not performed by a classification in the wage determination;

16.2.7.2. The classification is utilized in the area by the construction industry; and

16.2.7.3. The proposed wage rate, including bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

16.2.8. If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employee Standards Administration, U.S. Department of Labor, Washington, DC 20210.

16.2.9. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.

16.2.10. In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where
appropriate), HUD or its designee shall refer the questions, including the views of all
interested parties and the recommendation of HUD or its designee, to the Administrator of
the Wage and Hour Division for determination.

16.2.11. The Administrator or an authorized representative, will issue a determination
within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee
within the 30 day period that additional time was necessary.

16.2.12. The wage rate (including fringe benefits where appropriate) shall be paid to all
workers performing work in the classification under this contract from the first day on
which work is performed in classification.

16.2.13. Whenever the minimum wage rate prescribed in the contract for a class of
laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the
Contractor shall either pay the benefit as stated in the wage determination or shall pay
another bona fide fringe benefit or an hourly cash equivalent thereof.

16.2.14. If the Contractor does not make payments to a trustee or other third person,
the Contractor may consider as part of the wages of any laborer or mechanic the amount of
any costs reasonably anticipated in providing bona fide fringe benefits under a plan or
program; provided that the Secretary of Labor has found, upon the written request of the
Contractor, that the applicable standards of the Davis-Bacon Act have been met.

16.2.15. The Secretary of Labor may require the Contractor to set aside in a separate
account assets for the meeting of obligations under the plan or program.

16.3. Withholding of Funds

16.3.1. HUD or its designee shall, upon its own action or upon written request of an authorized
representative of the Department of Labor, withhold or cause to be withheld from the
Contractor under this contract or any other Federal contract with the same prime
Contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage
requirements, which is held by the same prime Contractor, so much of the accrued
payments or advances as may be considered necessary to pay laborers and mechanics,
including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor
the full amount of wages required by the contract.

16.3.2. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or
helper, employed or working in the construction or development of the Project, all or part
of the wages required by the contract, HUD or its designee may, after written notice to the
Contractor, take such action as may be necessary to cause the suspension of any further
payment, advance, or guarantee of funds until such violations have ceased.

16.3.3. HUD or its designee may, after written notice to the Contractor, disburse such amounts
withheld for and on account of the Contractor or subcontractor to the respective employees
to whom they are due.

16.4. Payrolls and Basic Records

16.4.1. Payrolls and basic records relating thereto shall be maintained by the Contractor during
the course of the work and preserved for a period of three years thereafter for all
laborers and mechanics working in the construction or development of the Project. Such
records shall contain:

16.4.1.1. The name, address, and social security number of each such worker;

16.4.1.2. His or her correct classification
16.4.1.3. Hourly rates of wages paid, including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in the Davis-Bacon Act;

16.4.1.4. Daily and weekly number of hours worked;

16.4.1.5. Deductions made; and

16.4.1.6. Actual wages paid.

16.4.2. Whenever the Secretary of Labor has found, under 29 CFR 5.5, that the wages of any laborer or mechanic include the amount of costs reasonably anticipated in providing benefits under a plan or program described in the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits.

16.4.3. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

16.4.4. The Contractor shall submit for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer for transmission to HUD or its designee.

16.4.5. The payrolls submitted shall set out accurately and completely all of the information required to be maintained.

16.4.6. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

16.4.7. The Contractor is responsible for the submission of copies of payrolls by all subcontractors (Approved by the Office of Management and Budget under OMB Control Number 1214-0149).

16.4.8. Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

16.4.8.1. That the payroll for the payroll period contains the information required to be maintained and that such information is correct and complete;

16.4.8.2. That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3; and

16.4.8.3. That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the Contract.

16.4.9. The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirements for submission of the "Statement of Compliance".

16.4.10. The falsification of any of the above certifications may subject the Contractor or
subcontractor to civil or criminal prosecution under Title 18 and Title 31 of the United States Code.

16.5. Records

16.5.1. The Contractor or subcontractor shall make the records available for inspection, copying, or transcription by authorized representatives of HUD or its designee, the Contracting Officer, or the Department of Labor and shall permit such representatives to interview employees during working hours on the job.

16.5.2. If the Contractor or Subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds.

16.5.3. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

16.6. Apprentices & Trainees

16.6.1. Apprentices will be permitted to work at less than predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship and Training, Employer and Labor Services (OATELS), or with a State Apprenticeship Agency recognized by OATELS, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by OATELS or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

16.6.2. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program.

16.6.3. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed.

16.6.4. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

16.6.5. Where a Contractor is performing construction on a project in a locality other than that in which registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed.

16.6.6. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination.

16.6.7. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program.

16.6.8. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification.
16.6.9. If the Administrator of the Wage and Hour Division determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

16.6.10. In the event OATELS, or a State Apprenticeship Agency recognized by OATELS, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

16.7. **Trainees**

16.7.1. Except as provided for in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

16.7.2. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

16.7.3. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination.

16.7.4. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program.

16.7.5. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed in the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate in the wage determination which provides for less than full fringe benefits for apprentices.

16.7.6. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate in the wage determination for the classification of work actually performed.

16.7.7. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate in the wage determination for the work actually performed.

16.7.8. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work until an acceptable program is approved.

16.8. **Equal Employment Opportunity:** The utilization of apprentices, trainees, and journeymen shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended and 29 CFR Part 30.

16.9. **Compliance with Copeland Act requirements:** Contractor shall comply with the requirements of 29 CFR Part 3, which are hereby incorporated by reference in this Contract.

16.10. **Contract Termination; Debarment:** A breach of this Article may be grounds for termination of the contract and for debarment as a Contractor and a subcontractor.

16.11. **Disputes Concerning Labor Standards:** Disputes arising out of the labor standards provisions of Disputes Concerning Labor Standards shall not be subject to ARTICLE 9 DISPUTE RESOLUTION/CLAIM PROCEDURE of this contract. Such disputes shall be resolved in accordance
with the procedures of the Department of Labor. Disputes within the meaning of Disputes Concerning Labor Standards include disputes between the Contractor (or any of its subcontractors) and GDPM, HUD, the U.S. Department of Labor, or the employees or their representatives.

16.12. **Certification of Eligibility:** By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor’s firm is a person or firm ineligible to be awarded contracts by virtue of the Davis-Bacon Act or 29 CFR 5.12.

16.12.1. No part of this contract shall be subcontracted to any person or firm ineligible for award of a United States Government contract by virtue of the Davis-Bacon Act or 29 CFR 5.12.


16.13. **Contract Work Hours and Safety Standards Act:** As used in this provision - Contract Work Hours and Safety Standards Act, the terms "laborers" and "mechanics" include watchmen and guards.

16.13.1. **Overtime Requirements**

16.14. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics, including watchmen and guards, shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one half pay for all hours worked in excess of 40 hours in such workweek.

16.15. **Violation; liability for unpaid wages; Liquidated Damages**

16.15.1. In the event of any violation, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages.

16.15.2. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages.

16.15.3. Such liquidated damages shall be computed with respect to each individual laborer or mechanic (including watchmen and guards) employed in violation, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages.

16.16. **Withholding for unpaid wages and liquidated damages**

16.16.1. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any Federal contract with the same prime Contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages.

16.17. **Subcontracts**

16.17.1. The Contractor or subcontractor shall insert in any subcontracts all the provisions contained in subcontracts, and such other clauses as HUD or its designee may by
appropriate instructions require, and also a clause requiring the subcontractors to include these provisions in any lower tier subcontracts.

16.17.2. The prime Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all these provisions.

16.18. Non-Federal Prevailing Wage Rates

16.18.1. Any prevailing wage rate (including basic hourly rate and any fringe benefits), determined under State or tribal law to be prevailing, with respect to any employee in any trade or position employed under the contract, is inapplicable to the contract and shall not be enforced against the Contractor or any subcontractor, with respect to employees engaged under the contract whenever such non-Federal prevailing wage rate exceeds:

16.18.1.1. The applicable wage rate determined by the Secretary of Labor pursuant to the Davis-Bacon Act (40 U.S.C. 276(a)) to be prevailing in the locality with respect to such trade;

16.18.1.2. An applicable apprentice wage rate based thereon specified in an apprenticeship program registered with the U.S. Department of Labor (DOL) or a DOL-recognized State Apprenticeship Agency; or

16.19. An applicable trainee wage rate based thereon specified in a DOL-certified trainee program.

17 ARTICLE XVIII: SECTION 3

17.1. In order to promote Employment, Training, and Contracting Opportunities for Low-Income Persons, the Contractor shall participate in GDPM's Section 3 Program.

17.1. The work to be performed under this Contract is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended.

17.2. The purpose of Section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by Section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

17.3. The parties to this contract agree to comply with HUD's regulations in 24 CFR Part 135, which implement Section 3.

17.4. As evidence by the execution of the Contract, the parties to this Contract certify that they are under no contractual or other impediments that would prevent them from complying with the Part 135 regulations.

17.5. The Contractor agrees to send to each labor organization or representative of workers with which the Contractor has a collective bargaining agreement or other understanding, if any, a narrative advising the labor organization or workers' representative of the Contractor's commitments, and will post copies of this notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice.

17.6. The notice shall describe the preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work will begin.

17.7. The Contractor agrees to include this Article - SECTION 3 in every subcontract subject to
compliance with regulations in 24 CFR Part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this Article upon a finding that the subcontractor is in violation of the regulations in 24 CFR Part 135.

17.8. The Contractor will not subcontract with any subcontractor where the Contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR Part 135.

17.9. The Contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the Contractor is selected but before the Contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR Part 135 require employment opportunities to be directed, were not filled to circumvent the Contractor's obligations under 24 CFR Part 135.

17.10. Noncompliance with HUD's regulations in 24 CFR Part 135 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.

17.11. Section 3 Reporting Requirements:
- Contractor must acknowledge and abide by any request for Section 3 documentation made by GDPM. In addition, contractor must follow any specific Section 3 reporting requirements required by GDPMs procurement department.

18 ARTICLE XVIII: Equal Opportunity Prohibition against Discrimination

18.1. During the performance of this contract, the Contractor agrees as follows:

18.1.1. Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, sexual orientation, or handicap.

18.1.2. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, national origin, or handicap. Such action shall include, but not be limited to:

18.1.2.1. Employment;
18.1.2.2. Upgrading;
18.1.2.3. Demotion;
18.1.2.4. Transfer;
18.1.2.5. Recruitment or recruitment advertising;
18.1.2.6. Layoff or termination;
18.1.2.7. Rates of pay or other forms of compensation; and
18.1.2.8. Selection for training, including apprenticeship.

18.1.3. The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by GDPM that explain this Article.

18.1.4. The Contractor shall, 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 race, color, religion, sex, national origin, or handicap.

18.1.5. The Contractor shall send, to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be
provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's commitments under this Article, and post copies of the notice in conspicuous places available to employees and applicants for employment.

18.1.6. The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.

18.1.7. The Contractor shall furnish all information and reports required by Executive Order 11246, as amended, the Rehabilitation Act of 1973, as amended, and by rules, regulations, and orders of the Secretary of Labor, pursuant thereto.

18.1.8. The Contractor shall permit access to its books, records, and accounts by the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

18.1.9. In the event of a determination that the Contractor is not in compliance with this Article or any rules, regulations, or order of the Secretary of Labor, this contract may be canceled, terminated or suspended in whole or in part, and the Contractor may be declared ineligible for further Government Contracts, or Federally assisted construction contracts under the procedures authorized, in Executive Order 11246, as amended.

18.1.10. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended, the rules, regulations, and orders of the Secretary of Labor, or as otherwise provided by law, including the following as provided by ORC:

18.1.10.1. In the event Contractor fails to comply with these nondiscrimination provisions, GDPM shall deduct from the amount payable to the Contractor a forfeiture of the statutory penalty pursuant to ORC for each person who is discriminated against or intimidated.

18.1.10.2. The Contract may be terminated or suspended in whole or in part by GDPM and all money due hereunder may be forfeited in the event of a subsequent violation of the foregoing nondiscrimination provisions.

18.1.11. The Contractor shall include the terms and conditions of this Article in every subcontract or purchase order unless exempted by the rules, regulations, or orders of the Secretary of Labor under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor.

18.1.12. The Contractor shall take such action with respect to any subcontract or purchase order as the Secretary of Housing and Urban Development or the Secretary of Labor may direct as a means of enforcing such provisions, including sanctions for noncompliance; provided that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction, the Contractor may request the United States to enter into the litigations to protect the interests of the United States.

18.1.13. Compliance with the requirements of this Article shall be to the maximum extent consistent with, but not in derogation of compliance with the Indian Self-Determination and Education Assistance Act and the Indians Preference clause of this Contract.

18.2. The Contractor shall cooperate fully with the States Equal Opportunity Coordinator (EOC), with any other official or agency of the state of federal government that seeks to eliminate unlawful employment discrimination, and with all other state and federal efforts to assure equal employment practices under the Contract.
ARTICLE XIX: HEALTH, SAFETY, AND ACCIDENT PREVENTION

19.1. **Contractor Obligations.** In performing this contract, the Contractor shall:

19.1.1. Take reasonable precautions to ensure safety of individuals on the Project;

19.1.2. Ensure that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his/her health and/or safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation;

19.1.3. Protect the lives, health, and safety of other persons;

19.1.4. Prevent damage to property, materials, supplies, and equipment;

19.1.5. Avoid work interruptions;

19.2. For these purposes, the Contractor shall:

19.2.1. Comply with regulations and standards issued by the Secretary of Labor (failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act);

19.2.2. Include the terms of this Article in every subcontract that such terms will be binding on each subcontractor. The Contractor shall be responsible for its subcontractors' compliance with the provisions of this Article;

19.2.2.1. The Contractor shall take such action with respect to any subcontract as GDPM, the Secretary of Housing or Secretary of Labor shall direct as a means of enforcing such provisions.

19.2.3. Maintain an accurate record of exposure data on all accidents incident to work performed under this contract resulting in death, traumatic injury, occupational diseases or damages to property, materials, supplies, or equipment, and shall report this data in the manner prescribed by 26 CFR 1904 applicable law;

19.2.4. Pay any fine or cost incurred because of Contractor's violation, or alleged violation, of any Applicable Law.

19.3. **Notification of Non-Compliance Procedure**

19.3.1. GDPM shall notify the Contractor of any noncompliance with these requirements and of the corrective action required. This notice, when delivered to the Contractor or the Contractor's representative at the site of the work, shall be deemed sufficient notice of the noncompliance and corrective action required.

19.3.2. After receiving the notice, the Contractor shall immediately take corrective action.

19.3.3. If the Contractor fails or refuses to take corrective action promptly, GDPM may issue an order stopping all or part of the work until satisfactory corrective action has been taken.

19.3.4. The Contractor shall not base any claim or request for equitable adjustment for additional time or money on any stop order issued under these circumstances.

19.4. **Safety Plan**

19.4.1. The Contractor is responsible for designing and implementing its own site-specific safety
plan, including compliance with OSHA regulations and such plan shall meet or exceed GDPM’s site-specific safety plan (if any).

19.4.2. Before starting any Work, the Contractor shall submit to GDPM a copy of the Contractor’s site-specific safety plan and safety manuals.

19.5. **Safety Data Sheets**

19.5.1. The Contractor shall identify any material it uses at the Site with a Safety Data Sheet ("SDS") meeting the requirements of OSHA’s Hazardous Communication Standard.

19.5.2. The Contractor shall maintain a notebook containing all of its applicable SDSs.

19.5.3. This notebook shall be kept at the Site for the duration of the Project.

19.6. **Hazardous Materials**

19.6.1. **Prohibition Against Hazardous Materials:** The Contractor shall not introduce Hazardous Materials to the Project.

19.6.2. **Work Stoppage Due to Hazardous Materials:**

   a. If the Contractor encounters material the Contractor reasonably believes to be, or contain, a Hazardous Material that has not been rendered harmless, the Contractor shall immediately stop Work in the affected area and verbally report the condition to GDPM, and within 1 business day deliver written notice of the condition to GDPM.

   b. GDPM will promptly determine the necessity of GDPM retaining a qualified environmental consultant to evaluate the suspected Hazardous Material and to issue a related written report.

   c. Where appropriate, GDPM will engage a licensed abatement contractor to remove the material or render it harmless as directed.

   d. The Contractor shall resume Work in the affected area upon written notice from GDPM that: (1) The suspect material was evaluated and found not to be or contain a Hazardous Material; or (2) The suspect material has been removed or rendered harmless.

   e. If the Contractor knowingly or negligently proceeds with the Work in an area where a Hazardous Material exists and has not been rendered harmless, the Contractor shall be solely responsible for all related claims, damages, losses, and expenses, including, but not limited to, attorneys’ fees, arising out of or resulting from performing the Work in the affected area.

   f. The term "rendered harmless" means that the level of exposure is less than any applicable exposure standards set forth in Applicable Law.

19.7. **Fires or Hot-Work**

19.7.1. Contractor shall not burn any fires on the Site(s).

   19.7.1.1. The Contractor shall notify the Project Manager 24 hours before the start of non-routine or non-recurring hot-work.

   a. Use of sources of fire, flame or sparks and flammable materials shall be kept to an absolute minimum.

   b. At the beginning of the Project, the Contractor shall inform the Project Manager of its intent to use blowtorches, welding apparatus or similar exposed flame
and sparking devices.

c. Similar notice shall be given in regard to the use of flammable liquids, adhesives, and cleaners.

19.7.2. The Contractor shall furnish an appropriate number of fire extinguishers (minimum of 1), which shall be within the immediate areas where work is being done at all times. The extinguisher shall be adequate and suitable for the class of fire likely to be caused by the Contractor’s operations.

19.8. Explosives and Blasting

19.8.1. The Contractor shall not conduct blasting on, or bring explosives to the Work Site without written approval of GDPM and other authorities with jurisdiction.

19.8.2. The Contractor shall perform all blasting, storing, and handling of explosives as required under Applicable Law.

19.8.3. The Contractor shall carry appropriate liability insurance coverage, as required by the Contract Documents, for its blasting and explosives storage and handling operations.

19.8.3.1. Immediately upon request, the Contractor shall deliver evidence of that insurance to GDPM.

20. ARTICLE XX: CONTRACT DOCUMENTS AND CONTRACT RECORDS

20.1. Examination and Retention of Contractor’s Records

20.1.1. GDPM, HUD, or the Comptroller of the United States, or any of their duly authorized representatives shall, until 6 years after final payment under this contract, have access to and the right to examine any of the Contractor’s directly pertinent books, documents, papers, or other records involving transactions related to this Contract for the purpose of making audit, examination, excerpts, and transcriptions.

20.1.2. The Contractor agrees to include in first-tier subcontracts under this contract a clause substantially the same as 20.1.1. "Subcontract," as used in Examination and Retention of Contractor’s Records, excludes purchase orders not exceeding $10,000.

20.1.3. The periods of access and examination for records relating to (1) appeals under the DISPUTE RESOLUTION/CLAIM PROCEDURE Article of this contract, (2) litigation or settlement of claims arising from the performance of this contract, or (3) costs and expenses of this contract to which GDPM, HUD, or Comptroller General or any of their duly authorized representatives has taken exception, shall continue until disposition of such appeals, litigation, claims, or exceptions.

20.1.4. If a dispute arises with any other Person about whether that Person should be given access to the documents, the Contractor or Subcontractor as applicable, shall indemnify GDPM against all costs, expenses, and damages, including but not limited to attorneys’ fees, incurred or paid by reason of that dispute.

20.1.5. The right of inspection, audit, and reproduction extends to all documents necessary to permit adequate evaluation of the cost of pricing data submitted along with the computations and projections used therein.

20.1.6. If the Contract has been terminated, in whole or in part, the records relating to the Work terminated shall be made available to GDPM for a period of 6 years from the date of any applicable final settlement or payment, as applicable.
20.2. **Examination and Audit of Contractor's Records**

20.1.7. GDPM may examine all books, records, documents and other data of the Contractor and its Subcontractors related to the bidding, pricing, or performance of the Work for the purpose of evaluating any Contractor Payment Request, Proposal, Modification, or Claim.

20.1.8. The above referenced materials shall be made available at the office of the Contractor or Subcontractor, as applicable, at all reasonable times for inspection, audit, and reproduction until the expiration of 6 years after the date of Substantial Completion of all Work.

20.1.8.1. The Contractor shall maintain, and require its Subcontractors to maintain complete and accurate business records at its principal place of business.

20.1.8.1.1. If the principal place of business is greater than 50 miles from the Site, the Contractor shall timely make records available, and shall require its Subcontractors to timely make records available, at the office of GDPM upon request for the records.

20.1.8.2. To the extent that the Contractor or Subcontractor, as applicable, informs GDPM in writing that any documents provided to GDPM are trade secrets, GDPM shall treat these documents, to the extent permitted by law, as trade secrets of the Contractor or Subcontractor, as applicable.

20.1.8.2.1. If a dispute arises with any other Person about whether that Person should be given access to the documents, the Contractor or Subcontractor as applicable, shall indemnify GDPM against all costs, expenses, and damages, including but not limited to attorneys' fees, incurred or paid by reason of that dispute.

20.1.9. The right of inspection, audit, and reproduction extends to all documents necessary to permit adequate evaluation of the cost of pricing data submitted along with the computations and projections used therein.

20.1.10. If the Contract has been terminated, in whole or in part, the records relating to the Work terminated shall be made available to GDPM for a period of 6 years from the date of any applicable final settlement or payment, as applicable.

20.1.11. Records that relate to disputes, litigation, or settlement of Claims arising out of the performance of the Work shall be made available until the dispute, litigation or Claims have been finally decided or settled.

20.3. **Ownership of Contract Documents**

20.1.12. GDPM shall have exclusive ownership of, all proprietary interest in, and the right to full and exclusive possession of all information, materials and documents discovered or produced by Contractor pursuant to the terms of this Contract, including but not limited to reports, memoranda, drawings or letters concerning the research and reporting tasks of this Contract.

20.1.13. For data other than computer software, the Contractor grants to GDPM and others acting on its behalf, a paid-up, nonexclusive, irrevocable, world-wide license in such copyrighted data to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly by or on behalf of GDPM.

20.1.14. GDPM alone owns the Contractor's Documents and the Contract Documents and
every right, title, and interest therein.

20.1.15. The Contractor must execute and deliver and cause its agents and subcontractors to execute and deliver, to GDPM any transfers, assignments, documents or other instruments necessary to vest in GDPM the complete right, title, interest in and ownership of the Contractor’s Documents.

20.1.16. The Contractor may retain copies of the Contractor's Documents and the Contract Documents for information, reference, and performance of the Work.

20.1.17. The submission or distribution of the Contractor's Documents or the Contract Documents to meet official regulatory requirements or for similar purposes in connection with the Project is not a waiver of GDPM's reserved rights in the Contractor's Documents.

20.1.18. Any unauthorized use of the Contractor's Documents or the Contract Documents shall be at the sole risk of the entity making the unauthorized use.

20.4. **Intent of Contract Documents**

20.1.19. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of Work by the Contractor.

20.1.20. The Contract Documents are complementary, and what is required by one is binding as if required by all.

20.1.21. The Contractor shall provide all labor materials necessary for the entire completion of the Work described in the Contract Documents and reasonably inferable to produce the intended results.

20.1.22. The Drawings govern dimensions, details, and location of the Work.

20.1.23. The Specifications govern the quality of materials and workmanship.

20.1.24. The organization of the Specifications in divisions, sections, and articles, and the arrangement of Drawings shall not restrict the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

20.1.25. Unless otherwise defined in the Contract Documents, words that have well known technical or construction industry meanings are used within those recognized meanings.

20.5. **Use of Electronic Files**

20.1.26. GDPM and Contractor reasonably expect that they will provide electronic files to each other to facilitate the design and construction of the Project consistent with current practices and customs in the construction industry.

20.1.27. GDPM and Contractor acknowledge that the use of electronic files involves risks not generally associated with the use of paper documents. Those risks may include, but not be limited to, alteration (inadvertent or intentional) and deterioration, both of which may not be apparent through casual observation.

20.1.28. In the event of a discrepancy between information contained in a paper version of a document and the electronic file of that document, the paper will govern.

20.1.29. Use of electronic files does not relieve the Contractor of its responsibility for the preparation, completeness, or accuracy of the Contractor’s Documents.
20.6. **Order of Precedence**

20.1.30. In the event of any inconsistency or conflict within any of the Contract Documents, the Contractor shall provide the better quality of Work and comply with the stricter requirement.

20.1.31. In the event of a conflict between the contract and any applicable state or local law or regulation, the state or local law or regulation shall prevail; provided that such state or local law or regulation applies to GDPM and does not conflict with, or is less restrictive than applicable federal law, regulation, or Executive Order.

20.1.31.1. In the event of such a conflict, applicable federal law, regulation, and Executive Order shall prevail.

21 **ARTICLE XXI: MISCELLANEOUS**

21.1. **Assignment:** The Contractor shall not assign or transfer any interest in this contract; except that claims for monies due or to become due from GDPM under the contract may be assigned to a bank, trust company, or other financial institution.

21.1.1. Such assignments of claims shall only be made with the written concurrence of GDPM.

21.1.2. If the Contractor is a partnership, this contract shall inure to the benefit of the surviving or remaining member(s) of such partnership as approved by GDPM.

21.1.3. **Assignment of Antitrust Claims:** By signing the Agreement, the Contractor assigns, conveys and transfers to GDPM any right, title, and interest to any claims or causes of action it may have or acquire under state or federal antitrust laws relating to any goods, products, or services purchased, procured, or rendered to GDPM pursuant to the Contract.

21.1.4. GDPM and Contractor each bind themselves, their successors, assigns and legal representatives, to the other party to this Contract and to the successors, assigns, and legal representatives of the other party with respect to the Contract.

21.2. **Contractor Performance Evaluation:** GDPM may evaluate the Contractor's Performance at any time including without limitation during the progress of the Work, at the completion of a phase of the Project, and/or completion of the Project.

21.2.1. GDPM shall retain the evaluation.

21.2.2. The Contractor may request a copy of the completed evaluation(s).

21.2.3. If the Contractor wishes to comment or take exception to any rating or remark, the Contractor must send a response in writing to GDPM within 30 days of Contract Completion and/or Termination.

21.2.4. GDPM may use the evaluation(s) in determining the responsibility of the Contractor for award of future contracts.

21.2.5. Poor evaluations may lead to a determination that Contractor is not responsible and therefore ineligible for award of future contracts for a period of not less than one year.

21.2.6. GDPM may request information from the Contractor for use in evaluating the A/E’s performance. If information is requested, the Contractor shall comply in a timely and responsive manner.

21.2.7. If a breach of the Contract is committed by the Contractor or is attributable to a Subcontractor, that breach will be used in the responsibility analysis of the Contractor and Subcontractor (where applicable) for future contracts or subcontracts for a period of 5 years.
after the date of the breach unless said breach results in Contractor being placed on debarment list, then for the period provided therein.

21.3. **Prohibition Against Liens:** The Contractor is prohibited from placing a lien on GDPM's property. This prohibition shall apply to all subcontractors at any tier and all material suppliers.

21.4. **Conflict of Interest**

21.4.1. **Interest of Members of Congress:** No member of or delegate to the Congress of the United States of America shall be admitted to any share or part of this contract or to any benefit that may arise therefrom.

21.4.2. **Interest of Members, Officers, or Employees and Former Members, Officers, or Employees:** No member, officer, or employee of GDPM, no member of the governing body of the locality in which the Project is situated, no member of the governing body of the locality in which GDPM was activated, and no other public official of such locality or localities who exercises any functions or responsibilities with respect to the Project, shall, during his or her tenure, or for one year thereafter, have any interest, direct or indirect, in this Contract or the proceeds thereof.

21.5. **Limitation on Payments Made to Influence Certain Federal Financial Transactions**

21.5.1. The Contractor agrees to comply with Title 31, United States Code which prohibits the use of Federal appropriated funds to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered Federal actions:

21.5.1.1. The awarding of any Federal contract;
21.5.1.2. The making of any Federal grant;
21.5.1.3. The making of any Federal loan;
21.5.1.4. The entering into of any cooperative agreement; or
21.5.1.5. The modification of any Federal Contract, grant, loan, or cooperative agreement.

21.5.2. The Contractor further agrees to comply with the requirement of the Act to furnish a disclosure (OMB Standard Form LLL, Disclosure of Lobbying Activities) if any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a Federal contract, grant, loan, or cooperative agreement.

21.6. **Procurement of Recovered Materials:** In accordance with the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, the Contractor shall procure items designated in guidelines of the Environmental Protection Agency (EPA) 40 CFR that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition.

21.6.1. The Contractor shall procure items designated in the EPA guidelines that contain the highest percentage of recovered materials practicable unless the Contractor determines that such items (1) are not reasonably available in a reasonable period of time; (2) fail to meet reasonable performance standards, which shall be determined on the basis of the
guidelines of the National Institute of Standards and Technology, if applicable to the item; or (3) are only available at an unreasonable price.

21.6.2. This provision **Procurement of Recovered Materials** shall apply to items purchased under this contract where:

21.6.2.1. The Contractor purchases in excess of $10,000 of the item under this contract; or

21.6.2.2. During the preceding: (1) purchased any amount of the items for use under a contract that was funded with Federal appropriations and was with a Federal agency or a State agency or agency of a political subdivision of a State; and (2) purchased a total of in excess of $10,000 of the item both under and outside that contract.

21.7. **Royalties and Patents:** The Contractor shall pay all royalties and license fees and assume all costs incident to the use, in the performance of the Work or the incorporation in the Work, of any design, inventions, process, product, or device that is the subject of patent rights or copyrights held by others.

21.7.1. Contractor shall defend all suits or claims for infringement of any patent rights or copyrights and shall save GDPM harmless from loss on account thereof; except that GDPM shall be responsible for any such loss when a particular design, process, or the product of a particular manufacturer or manufacturers is specified and the Contractor has no reason to believe that the specified design, process, or product is an infringement.

21.7.2. If, however, the Contractor has reason to believe that any design, process or product specified is an infringement of a patent or copyright, the Contractor shall promptly notify the Contracting Officer.

21.7.2.1. Failure to give such notice shall make the Contractor responsible for resultant loss.

21.8. **Contract Period:** The Contractor shall complete all Work required within the required number of days of the effective date of the contract as set forth in the solicitation, supplemental terms, or within the time schedule established in the notice to proceed issued by GDPM.

21.9. **Other Contracts:** GDPM may undertake or award other contracts for additional work at or near the site of the work under this contract.

21.9.1. The Contractor shall fully cooperate with the other contractors and with GDPM employees and shall carefully adapt scheduling and performing the work under this contract to accommodate the additional work, heeding any direction that may be provided by GDPM.

21.9.2. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor or by GDPM employees.

21.10. **Drug-Free Workplace:** Each contractor shall be enrolled in and in good standing and shall require all subcontractors with whom the Contractor is in contract for the public improvement to be enrolled in and be in good standing in the Bureau of Workers’ Compensation's Drug-Free Workplace Program or a comparable program approved by the Bureau that meets the requirements specified in the Revised Code prior to a subcontractor providing labor at the project site of the public improvement.

21.11. **Energy Efficiency and Sustainability Requirements:** The Contractor shall comply with mandatory standards and policies relating to energy efficiency which are contained in the energy conservation plan issued in compliance with the Energy Policy and Conservation Act for the State in which the work under the contract is performed.

21.11.1. If the Project is designed and constructed under the Leadership in Energy and Environmental Design ("LEED") Rating System developed by the U.S. Green Building
Council or another rigorous rating system used to facilitate achievement of sustainability goals for the Project, the Contractor shall provide submittals certifying achievement of sustainable designed rating system criteria for verification by the Green Building Certification Institute or other third party in accordance with the Contract Documents.

21.12. **Clean Air and Water:** The contractor shall comply with the Clean Air Act, as amended 42 USC, the Federal Water Pollution Control Water Act, as amended 33 U.S.C., and standards issued pursuant thereto in the facilities in which this contract is to be performed.

21.13. **Public Relations:** Public relations or publicity about the Project shall be solely within the control of and consent of GDPM.

21.13.1. Contractor shall submit to GDPM all advertising and publicity related material relating to this Contract, including without limitation, information provided in social media, wherein GDPM's name is mentioned or language used from which the connection of GDPM's name may, in GDPM's judgment, be inferred or implied.

21.13.2. Contractor shall not publish or use such advertising and publicity matters without prior express written consent of GDPM.

21.14. **Governing Law:** This Contract shall be governed and construed exclusively by its terms and by the laws of the State of Ohio and any suit filed to enforce any term of this Contract shall be filed only in a court of competent jurisdiction in Montgomery County, Ohio. The parties to this Contract shall comply with Applicable Law.

21.15. **Written Notice:** Notice under the Contract Documents shall be validly given if delivered personally to a member of the organization for whom the notice is intended.

21.16. **Taxes:** Parties acknowledge that GDPM is a tax exempt entity and Contractor must use tax exemption status for all purchases made for the Project in which tax exemption is permitted under law.

21.17. **Computing Time:** When the Contract Documents refer to a period of time by a number of days, the period shall be computed to exclude the first and include the last day of the period. If the last day of the period falls on a Saturday or Sunday, or a legal holiday, that day shall be omitted from the computation and the period shall end on the next business day.

21.17.1. Except as excluded, the Contract Times and all other periods referred to in the Contract Documents includes Saturdays, Sundays, and all days defined as legal holidays below.

21.17.2. The standard workdays for the Work are Monday through Friday, excluding legal holidays.

21.17.3. The Legal Holidays are as follows:

- New Year’s Day
- Martin Luther King Jr. Day
- President’s Day
- Memorial Day
- Independence Day
- Labor Day
- Columbus Day
- Veterans Day
- Thanksgiving Day
21.18. **Time is of the Essence:** All time limits set forth in the Contract Documents are of the essence.

21.18.1. By signing this Contract, Contractor acknowledges that the Contract Times are reasonable, taking into consideration the usual weather and other conditions prevailing in the locality of the Project.

21.18.2. By Signing the Construction Schedule, the Contractor acknowledges that the specified milestone dates are reasonable, taking into consideration the usual weather and other conditions prevailing in the locality of the Project.

21.18.3. The Notice to Proceed Establishes the date for commencement of the Work.

21.18.4. The Contractor acknowledges that it may be subject to interference, disruption, hindrance, or delay in the progress of the Work from any cause. The sole remedy for such interference, disruption, hindrance, or delay shall be an extension of the Contract Time, unless otherwise required by law.

21.19. **Extent of Contract:** The Contract Documents represent the entire and integrated agreement between GDPM and the Contractor and supersede all prior negotiations, representations, or agreement, either written or oral. This Contract may be executed in any number of counterparts, each of which shall be regarded as original and all of which constitute but one and the same instrument. The captions and headings in this Contract are for convenience only and in no way define, limit, or describe the scope or intent of any of the provisions or sections hereof.

21.20. **Severability:** If any provision of this Contract is determined by a court having jurisdiction to be unenforceable to any extent, the rest of the provisions of this Contract will remain enforceable to the fullest extent permitted by law.

21.21. **Electronic Signature:** Any party hereto may deliver a copy of its counterpart signature page of any Contract Documents via email, fax, or web-based project management software. Each party shall be entitled to rely upon a scanned or facsimile signature of the other party in such a manner as if such a signature were an original.

21.22. **No Third Party Interest:** Except as expressly provided herein, no person or entity, other than GDPM and Contractor, will have any right or interest under the Contract, and the Contract does not create a contractual relationship of any kind between any persons or entities other than GDPM and the Contractor.

21.23. **No Waiver:** The failure of GDPM or Contractor to insist on any one or more instances upon strict performance of any one or more of the provisions of the Contract or to exercise any rights under the Contract or provided by law will not be construed as a waiver or relinquishment of that provision or of the right to subsequently demand strict performance or exercise the right and the rights will continue unchanged and remain in full force and effect.

21.24. **Survival of Obligations:** All representations, indemnity obligations, warranties, guarantees, and other expressed continuing obligations under the Contract, will survive final payment, completion and acceptance of the Work, and termination or completion of the Contract.

21.25. **Force Majeure:** Neither party shall be liable for failure to perform if such failure is caused by conditions beyond its control including, but not limited to, Acts of God, Government restrictions (including the denial or cancellation of any export or other necessary license), wars, and/or insurrections.

21.26. **Privacy:** The Contractor agrees to Comply with the Privacy Act of 1974 (the Act) and the
agency rules and regulations issued under the Act and any Personal information collected, used, or acquired in connection with this Contract shall be protected against unauthorized use, disclosure, modification or loss. Contractor shall ensure that its directors, officers, employees, subcontractors or agents use personal information solely for the purposes of accomplishing the services set forth herein.

21.26.1. Contractor agrees not to release, divulge, publish, transfer, sell or otherwise make known to unauthorized persons personal information without express written consent of GDPM or otherwise required by law.

21.26.2. Contractor agrees to indemnify and hold harmless GDPM for any damages related to Contractor’s unauthorized use of personal information.

21.27. Contractor Status: It is understood that the Contractor is an independent contractor and is not to be considered an employee of GDPM, or assume any right, privilege or duties of an employee.
Bid Form

To: Greater Dayton Premier Management
400 Wayne Avenue
Dayton, Ohio 45410
Phone: 937.910.7500  Fax: 937.222.3554

Having carefully read and examined the "Scope of Work", "Specifications", "Plans", "GDPM General Terms and Conditions for Construction Services", and any addendum for:

RAD Rehabilitation
2531 Revere Rd.
Dayton, Ohio 45419

As prepared by:
Berardi+Partners, Inc.
1398 Goodale Blvd.
Columbus Oh 43212
614-221-1110
Joseph Berardi

The undersigned acknowledges and agrees to all covenants, terms, and conditions as set forth in the documents specified above, and having inspected the premises and all conditions affecting the work, the undersigned proposes to furnish all materials and perform all labor necessary for the performance and completion of the work indicated below, all in compliance with the documents named above. Further, by signing below and through submitting its bid, the undersigned acknowledges and that the undersigned has carefully reviewed and agrees to all covenants, terms, and conditions as set forth in the GDPM General Terms and Conditions for Construction Services contained herein and which terms are final, binding and shall not be subject to modification.

Submitted by: ________________________________

Contracting Firm

Having read and examined the Contract Documents, prepared by the Associate for the above-referenced Project, and the following Addenda:

<table>
<thead>
<tr>
<th>Addendum No.</th>
<th>Date of Receipt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td></td>
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<td></td>
<td></td>
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</tbody>
</table>
Bid Bond or Certified Check is included as part of Contractor’s bid submittal: _______Yes _______No

Bidder Initials _________________

Affidavit of Intent to Store Materials is included as part of Contractor’s bid submittal: _____Yes _____No

Bidders Initials _________________

MBE Participation: GDPM has established goals of twenty-five (25%) Minority Business Enterprise Participation.

To achieve this goal, contractors are encouraged to engage in joint ventures with MBE’s to include MBE’s as subcontractors, and utilize other initiatives that enhance opportunities for MBE’s.

Should the contractor be unable to achieve this goal, supporting documentation and notarized affidavits, indicating MBE’s date of notification, MBE’s date of response, nature of response or no response. Provide conclusion as to why the bid submitted does not meet MBE requirements.

The bid submittal includes a minimum of 25% MBE Participation: _______Yes _______No

Bidder’s Initials _________________

1. BASE BID:

A. BASE BID – Rehabilitation at 2531 Revere Road: Divisions 1-32, all work inclusive

<table>
<thead>
<tr>
<th>Labor</th>
<th>Material</th>
<th>Total Bid 2531 Revere</th>
</tr>
</thead>
<tbody>
<tr>
<td>$_____________________</td>
<td>$_____________________</td>
<td>$_____________________</td>
</tr>
</tbody>
</table>

Unforeseen Conditions Allowance $47,269.00 $Forty Seven Thousand Two Hundred Sixty Nine Dollars

Aid to Construction Allowance $5,000 $Five Thousand Dollars

Total Combined Bid $_____________________ $_____________________
C. GDPM intends to award the entire project providing it is within the funding limits, available budget, and overall estimate for the project.

2. ALTERNATES: None identified

3. UNIT PRICES:

Contractor to complete Unit Cost Sheet. These prices will be used to calculate costs for any Change Orders, etc., increases or decreases in Contract Amount.

Owner may also use unit costs if unforeseen conditions are encountered during construction, making certain changes necessary, or if the Owner desires to order additional Work or delete part of the Work as shown. Unit Costs will be reviewed closely and can be a determining factor in awarding the contract. Contractor shall submit complete list of all unit prices (which may affect his work in any way) with this proposal. All unit prices shall include Contractor’s overhead and profit. Prices should include all accessories, coordination and ancillary work necessary for a complete installation.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
<th>Labor</th>
<th>Materials</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Additional concrete walk replacement</td>
<td>SF</td>
<td>$_____</td>
<td>$_____</td>
<td>$_____</td>
</tr>
<tr>
<td>2.</td>
<td>Additional masonry tuck pointing.</td>
<td>SF</td>
<td>$_____</td>
<td>$_____</td>
<td>$_____</td>
</tr>
<tr>
<td>3.</td>
<td>Additional gypsum board repairs.</td>
<td>SF</td>
<td>$_____</td>
<td>$_____</td>
<td>$_____</td>
</tr>
<tr>
<td>4.</td>
<td>4’x8’x5/8” gypsum board material and installation at level 5 finish</td>
<td></td>
<td>$_____</td>
<td>$_____</td>
<td>$_____</td>
</tr>
<tr>
<td>5.</td>
<td>Additional painted wood casing replace</td>
<td>LF</td>
<td>$_____</td>
<td>$_____</td>
<td>$_____</td>
</tr>
<tr>
<td>6.</td>
<td>Asphalt Paving</td>
<td>SF</td>
<td>$_____</td>
<td>$_____</td>
<td>$_____</td>
</tr>
</tbody>
</table>

4. PROJECT CHANGES

Contractor shall indicate the amount of overhead and profit to be added to changes to the project.

For ADDS to the work: Overhead_______%  Profit _________%

For DEDUCTS to the work: Overhead_______%  Profit _________%

The Time of Completion for the Contract shall not exceed Three Hundred Sixty Five days (365) days from date of Notice to Proceed.

Contractor proposes a Time of Completion for the Contract

The full name and address of all persons and parties interested in the foregoing proposals as principals are as follows:
Bid Form

Bidder __________________________________________________________________________
Address __________________________________________________________________________
Phone __________________ Fax _______________________________________________________

If the Contractor is entering into a partnership to perform the work, provide the following information for
the partnering firm:

Bidder __________________________________________________________________________
Address __________________________________________ Fax ____________________________

Addendums Received: (Please list) ___________________________________________________

__________________________________________________________

Bidder’s Signature_____________________________________
Typed Name_________________________________________
Title________________________________________________

Note: The Bidder will sign his bid on the line indicated above; if it will be a partnership, the firm name will
be signed, followed by the signature of the partner signing. If a corporation, name will be signed followed
by the signature and the official title of the officer signing name.

Bidder’s Certification

The Bidder hereby acknowledges that the following representations in this bid are material and not mere
recitals:

1. The undersigned, having carefully read and examined the “Notice to Bidders”, “Instructions to
Bidders”, “General Conditions”, “General Requirements”, “Specifications”, “Plans” and any
addendum for: RAD Rehabilitation 2531 Revere Road - as prepared by the Berardi+Partners,
Inc. Architects/Engineers., and having inspected the premises and all conditions affecting the
work, the undersigned proposes to furnish all materials and perform all labor necessary for the
performance and completion of the work indicated below, all in compliance with the documents
named above, and further agrees that each separate item or trade or employment entered in this
Proposal shall be considered as a separate bid for that kind of work. The undersigned further
agrees that, if any or all of said bids are accepted, he will enter into a Contract according to the
form required by the Owner for the faithful performance of the labor and the furnishing of all
materials included in such bid or bids so accepted.

2. In submitting this bid it is understood that the Greater Dayton Premier Management reserves the
right to reject any and all bids. It is agreed that this bid may not be withdrawn for a period of one
hundred twenty (120) days subsequent to the opening of bids without the consent of Greater
Dayton Premier Management.

3. Security in the sum of ________________________________ Dollars
($____________) in the form of ________________________________ is submitted
herewith in accordance with the Specifications.
4. Attached hereto is an affidavit in proof that the undersigned has not entered into collusion with any person in respect to this bid or any other bid or the submitting of bids for the contract for which this bid is submitted. Also attached is a statement of Contractor's qualifications.

5. Bidder hereby agrees to comply with all City, State and Federal Statutes relating to Liability Insurance, Working Hour, Safety and Sanitary Regulations. Bidder further agrees that their bid amount includes all fees for permits, taxes, and insurance required or applicable to the work.

6. The Bidder will sign his bid on the line indicated below; if it will be a partnership the firm name will be signed, followed by the signature of the partner signing, his own name to be signed on the line beginning with the work "By"; if a corporation, name will be signed followed by the signature and the official title of the officer signing name.

7. The Bidder has read and understands the Contract Documents and agrees to comply with all requirements of the Contract Documents, regardless of whether the Bidder has actual knowledge of the requirements and regardless of any statement or omission made by the Bidder which might indicate a contrary intention.

8. The Bidder represents that the bid is based upon the Standards specified in the Contract Documents.

9. The Bidder has visited the project site, become familiar with the local conditions and has correlated personal observations about the requirements of the Contract Documents. The Bidder has no outstanding questions regarding the interpretation or clarification of the Contract Documents.

10. The Bidder and each person signing on behalf of the Bidder certifies, and in the case of a joint or combined bid, each party thereto certifies as to such parties organization, under penalty of perjury, that to the best of the undersigned's knowledge and belief: a) the Base Bid, any Unit Prices and any Alternate Bid in the bid having been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition as to any matter relating to such Base Bid, Unit Prices or Alternate Bid, with any other; b) unless otherwise required by law, the Base Bid, any Unit Prices and any Alternate bid in the bid have not been knowingly disclosed by the Bidder and will not knowingly be disclosed by the Bidder prior to the bid opening, directly or indirectly, to any other Bidder who would have any interest in the Base Bid, Unit Prices or Alternate Bid; c) no attempt has been made or will be made by the Bidder to induce any other individual, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

11. The Bidder will enter into and execute the Contract with Greater Dayton Premier Management (GDPM). If a Contract is awarded on the basis of this bid, and if the Bidder does not execute a Contract for any reason, other than as authorized by law, the Bidder and the Bidder's Surety are liable to GDPM as indicated in the Instructions to Bidders and in the General Conditions of the Contract.

12. The Bidder certifies that upon the award of a Contract, the Contractor will make a good faith effort to ensure that all of the Contractor's employees, while working on the project site, will not purchase, transfer, use or possess illegal drugs or alcohol or abuse prescription drugs in any way.

13. GDPM reserves the right to reject any/all bids for any reason.

If the Bidder is a Corporation, partnership or sole proprietorship, an officer, partner or principal of the Bidder, as applicable, shall print or type the legal name of the Bidder on the line provided and sign the Bid Form. If the Bidder is a joint venture, an officer, partner or principal, as applicable, of each member
of the joint venture shall print or type the legal name of the applicable member on the line provided and **sign the Bid Form**. All signatures must be original.

<table>
<thead>
<tr>
<th>Bidder's Name:</th>
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<tbody>
<tr>
<td>Authorized Signature:</td>
<td></td>
</tr>
<tr>
<td>Print name:</td>
<td></td>
</tr>
<tr>
<td>Title:</td>
<td></td>
</tr>
<tr>
<td>Company Name:</td>
<td></td>
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<td>Mailing Address:</td>
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<td>Telephone Number:</td>
<td></td>
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<td>Facsimile Number:</td>
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<tr>
<td>Where incorporated:</td>
<td></td>
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<tr>
<td>Federal Identification Number:</td>
<td></td>
</tr>
<tr>
<td>Dunn and Bradstreet Number:</td>
<td></td>
</tr>
<tr>
<td>Contact Person for Contract processing:</td>
<td>(Please print)</td>
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</tbody>
</table>

**Additional Signature for Joint Venture:**

<table>
<thead>
<tr>
<th>Bidder's Name:</th>
<th></th>
</tr>
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<tbody>
<tr>
<td>Authorized Signature:</td>
<td></td>
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<tr>
<td>Print name:</td>
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<tr>
<td>Title:</td>
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<tr>
<td>Where incorporated:</td>
<td></td>
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<tr>
<td>Federal Identification Number:</td>
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<tr>
<td>Dunn and Bradstreet Number:</td>
<td></td>
</tr>
<tr>
<td>Contact Person for Contract processing:</td>
<td>(Please print)</td>
</tr>
</tbody>
</table>
SECTION 00 7100
CONTRACTING DEFINITIONS

PART 1 GENERAL

1.01 APPLICABILITY:

A. These definitions are integral to the Agreement, for the portions of the work which are managed throughout the process of construction, or in the case of 'design assist' by the Contractor in conjunction with the Owner, the Architect and Project Engineers.

1.02 DEFINITIONS - DESIGN-BUILD DOCUMENTS

A. Contract Documents: As defined in the Conditions of the Contract and as follows:
   1. At the time of execution of the Agreement, the Contract Documents consist of the following:
      a. The Agreement and Conditions of the Contract, and other documents listed on the Table of Contents under the heading Contracting Requirements.
      b. The Proposal and Proposal Exhibits, except for provisions that contradict the requirements of the Conceptual Documents and that are not specifically accepted by the Owner by means of written Modification prior to execution of the Agreement.
   2. From time to time after execution of the Agreement, upon approval by the Owner, the following types of documents will be incorporated into the Contract Documents:
      a. Drawings and other documents documenting the design.
      b. Construction drawings and specifications detailing the execution of the design. All drawings, plans, specifications, other instructions including manufacturer's requirements for installation and any other documents which provides direction for completing the work schedules for the completion of the project.

B. Project Program: The Owner's requirements for size, arrangement, organization, and location of functional spaces, description of space functions, identification of fittings, equipment, and furnishings, description of the physical and environmental requirements for each space, together with a description of the image, goals, or "mission" of the project.

C. Proposal: The Proposal Form and Exhibits, which comprise the information prepared by the prospective Design-Builder to show their method of complying with the Conceptual Documents.

1.03 DEFINITIONS - TIME PERIODS AND MILESTONE DATES

A. Proposal Period: The time period during which prospective Proposers prepare their Proposals.
   1. Substantiation specified to occur during the Proposal period are intended to accompany the Proposal.

B. Preliminary Design: The time period during which the design criteria are finalized and preliminary drawings and written descriptions are prepared to illustrate the proposed design of the work or a portion of the work to the Owner, as described in the Conditions of the Contract.

C. Design Development: The time period during which the form, arrangement, size, and materials of the work or a portion of the work are determined as described in the Conditions of the Contract.

D. Construction Documents: The time period during which process working drawings, specifications, and other documents describing the work or a portion of the work are prepared in sufficient detail to allow accurate and complete construction.

E. Construction: The time period from the beginning of work on the project site until final payment as defined in the Conditions of the Contract.

F. Substantial Completion: The date as defined in the Conditions of the Contract. Date of Substantial Completion is the due date for the following:
   1. Design-Builder or Architect's complete punchlist of items to be completed.
   2. Owner's complete punchlist of items to be completed.
   3. Compliance with requirements of governing authorities, for submittals, inspections, and permits.
4. Compliance with Owner’s requirements for access to areas occupied by the Owner.
5. Final cleaning.
7. Warranties.
8. Spare parts and extra materials.
9. Maintenance supplies and tools.
11. Final site survey.

G. Closeout: The time period during which all details of both construction and commissioning are completed.
1. The Closeout period is the time from Date of Substantial Completion until final payment, both as defined by the Conditions of the Contract.
2. Before and during the Closeout period, the Owner will ascertain whether the completed project complies with the Contract Documents.
3. Contractor is responsible for operation and maintenance of the project until the end of the Closeout period; except for those areas the owner has moved into. Once the owner has moved into an area the contractor’s responsibilities for operation and maintenance of that area will cease.
4. Training of Owner’s personnel in operation and maintenance occurs during the Closeout period, unless specifically indicated otherwise for certain items.

H. Occupancy: The time period during which the project is occupied for its intended purpose.
1. The Occupancy period begins at Date of Substantial Completion, as defined by the Conditions of the Contract.
2. Move-in will occur before the end of the Closeout period.
3. Design-Builder is responsible for operation and maintenance of the project until the end of the Closeout period.

I. Correction Period: The time period defined by the Conditions of the Contract.
SECTION 01 5713
TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Prevention of erosion due to construction activities.
B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
C. Restoration of areas eroded due to insufficient preventive measures.
D. Performance bond.
E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS
G. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.
I. USDA TR-55 - Urban Hydrology for Small Watersheds; USDA Natural Resources Conservation Service; 2009.

1.04 PERFORMANCE REQUIREMENTS
A. Comply with requirements of EPA (NPDES) for erosion and sedimentation control, as specified by the NPDES, for Phases I and II, and in compliance with requirements of Construction General Permit (CGP), whether the project is required by law to comply or not.
C. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.
D. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
E. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.
F. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
G. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.

H. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
1. Control movement of sediment and soil from temporary stockpiles of soil.
2. Prevent development of ruts due to equipment and vehicular traffic.
3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

I. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
1. Prevent windblown soil from leaving the project site.
2. Prevent tracking of mud onto public roads outside site.
3. Prevent mud and sediment from flowing onto sidewalks and pavements.
4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

J. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

K. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.

L. Open Water: Prevent standing water that could become stagnant.

M. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.05 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Erosion and Sedimentation Control Plan:
1. Submit not less than 30 days prior to anticipated start of clearing, grading, or other work involving disturbance of ground surface cover.
2. Include:
   a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
   b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
   c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
   d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
   e. Other information required by law.
   f. Format required by law is acceptable, provided any additional information specified is also included.
3. Obtain the approval of the Plan by authorities having jurisdiction.
4. Obtain the approval of the Plan by Owner.

C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements. signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.

D. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

PART 2 PRODUCTS

2.01 MATERIALS

A. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

B. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:

1. Average Opening Size: 30 U.S. Std. Sieve (0.600 mm), maximum, when tested in accordance with ASTM D4751.
   2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D4491.
   3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
   4. Tensile Strength: 100 pounds-force (450 N), minimum, in cross-machine direction; 124 pounds-force (550 N), minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
   5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4533.

C. Silt Fence Posts: One of the following, minimum 5 feet (1500 mm) long:

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 INSTALLATION

A. Silt Fences:

1. Store and handle fabric in accordance with ASTM D4873.

2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch (405 mm) high barriers with minimum 36 inch (905 mm) long posts spaced at 6 feet (1830 mm) maximum, with fabric embedded at least 4 inches (100 mm) in ground.

3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch (710 mm) high barriers, minimum 48 inch (1220 mm) long posts spaced at 6 feet (1830 mm) maximum, with fabric embedded at least 6 inches (150 mm) in ground.

4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet (6 m), use nominal 32 inch (810 mm) high barriers with woven wire reinforcement and steel posts spaced at 4 feet (1220 mm) maximum, with fabric embedded at least 6 inches (150 mm) in ground.

5. Install with top of fabric at nominal height and embedment as specified.

6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches (460 mm), with extra post.
7. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches (300 mm) high with post spacing not more than 4 feet (1220 mm).

B. Temporary Seeding:
1. When hydraulic seeder is used, seedbed preparation is not required.
2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft (0.5 kg per 100 sq m).
4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft (6 to 8 kg per 100 sq m).
5. Incorporate fertilizer into soil before seeding.
6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch (12 to 25 mm) deep.
7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
8. Repeat irrigation as required until grass is established.

3.04 MAINTENANCE
A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches (13 mm) or more rainfall at the project site, and daily during prolonged rainfall.
B. Repair deficiencies immediately.
C. Silt Fences:
1. Promptly replace fabric that deteriorates unless need for fence has passed.
2. Remove silt deposits that exceed one-third of the height of the fence.
3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
D. Straw Bale Rows:
1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
2. Remove silt deposits that exceed one-half of the height of the bales.
3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
E. Clean out temporary sediment control structures weekly and relocate soil on site.
F. Place sediment in appropriate locations on site; do not remove from site.

3.05 CLEAN UP
A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect & Building Systems Engineer.
B. Clean out temporary sediment control structures that are to remain as permanent measures.
C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.
B. Transportation, handling, storage and protection.
C. Product option requirements.
D. Substitution limitations.
E. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
B. Section 01 4000 - Quality Requirements: Product quality monitoring.
C. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
D. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.
E. Section 23 0513 - Common Motor Requirements for HVAC Equipment: Motors for HVAC equipment.

1.03 REFERENCE STANDARDS

C. NEMA MG 1 - Motors and Generators; 2014.
D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

1.05 QUALITY ASSURANCE

A. Health Product Declarations (HPD): Complete, published declaration with full disclosure of known hazards, prepared using one of the HPDC (HPD-OLT) online tools.
B. Manufacturer's Inventory of Product Content: Publicly available inventory of every ingredient identified by name and Chemical Abstract Service Registration Number (CAS RN).
   1. For ingredients considered a trade secret or intellectual property, the name and CAS RN may be omitted, provided the ingredient's role, amount, and GreenScreen Benchmark are given.
PART 2  PRODUCTS

2.01  NEW PRODUCTS
A. Provide new products unless specifically required or permitted by the Contract Documents.
B. Use of products having any of the following characteristics is not permitted:
   1. Made outside the United States, its territories, Canada, or Mexico.
   2. Made using or containing CFC's or HCFC's.
   3. Made of wood from newly cut old growth timber.
C. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 6116.
   2. If wet-applied, have lower VOC content, as defined in Section 01 6116.
   3. Are extracted, harvested, and/or manufactured closer to the location of the project.
   4. Have longer documented life span under normal use.
   5. Result in less construction waste. See Section 01 7419
D. Motors: Refer to Section 23 0513 - Common Motor Requirements for HVAC Equipment, NEMA MG 1 Type. Specific motor type is specified in individual specification sections.

2.02  PRODUCT OPTIONS
A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.03  MAINTENANCE MATERIALS
A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
B. Deliver to Project site; obtain receipt prior to final payment.

PART 3  EXECUTION

3.01  SUBSTITUTION LIMITATIONS
A. See Section 01 2500 - Substitution Procedures.

3.02  TRANSPORTATION AND HANDLING
A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
D. Transport and handle products in accordance with manufacturer's instructions.
E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.
3.03 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

G. Comply with manufacturer's warranty conditions, if any.

H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

I. Prevent contact with material that may cause corrosion, discoloration, or staining.

J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES

A. VOC restrictions for product categories listed below under "DEFINITIONS."

B. All products of each category that are installed in the project must comply; Owner's project goals do not allow for partial compliance.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 6000 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

1.03 DEFINITIONS

A. VOC-Restricted Products: All products of each of the following categories when installed or applied on-site in the building interior:

B. Interior of Building: Anywhere inside the exterior weather barrier.

1.04 REFERENCE STANDARDS

A. CAL (CHPS LEM) - Low-Emitting Materials Product List; California Collaborative for High Performance Schools (CHPS); current edition at www.chps.net/.


C. CRI (GLCC) - Green Label Testing Program - Approved Product Categories for Carpet Cushion; Carpet and Rug Institute; Current Edition.


E. GreenSeal GS-11 - Paints; Green Seal, Inc.; 1993.

F. GreenSeal GS-36 - Commercial Adhesives; 2011.

G. SCAQMD 1113 - South Coast Air Quality Management District Rule No.1113; current edition.

H. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

I. SCS (CPD) - SCS Certified Products; current listings at www.scscertified.com.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Evidence of Compliance: Submit for each different product in each applicable category.

C. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MATERIALS

A. All VOC-Restricted Products: Provide products having VOC content of types and volume not greater than those specified in State of California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers.

1. Evidence of Compliance: Acceptable types of evidence are:
d. Current certification by any other agencies acceptable to CHPS.
e. Report of laboratory testing performed in accordance with CHPS requirements for getting a product listed in the Low-Emitting Materials Product List; report must include laboratory's statement that the product meets the specified criteria.

2. Product data submittals showing VOC content are NOT acceptable forms of evidence.

B. Paints and Coatings: Provide products having VOC content as specified in Section 09 9000.

C. Carpet Cushion: Provide products having VOC content not greater than that required for CRI Green Label certification.
   1. Evidence of Compliance: Acceptable types of evidence are:
      b. Report of laboratory testing performed in accordance with requirements.

D. Composite Wood and Agrifiber Products and Adhesives Used for Laminating Them: Provide products having no added urea-formaldehyde resins.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Published product data showing compliance with requirements.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION
SECTION 02 4100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Abandonment and removal of existing utilities and utility structures.

1.02 RELATED REQUIREMENTS
A. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.
B. Section 01 1000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.
C. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
D. Section 01 6000 - Product Requirements: Handling and storage of items removed for salvage and relocation.
E. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
F. Section 01 7419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
G. Section 31 2323 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Site Plan: Showing:
   1. Areas for temporary construction and field offices.
   2. Areas for temporary and permanent placement of removed materials.
C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 2 PRODUCTS

2.01 MATERIALS
A. Fill Material: As specified in Section 31 2323 - Fill.

PART 3 EXECUTION

3.01 SCOPE
A. Within area of new construction, remove foundation walls and footings to a minimum of 2 feet (600 mm) below finished grade.
B. Outside area of new construction, remove foundation walls and footings to a minimum of 2 feet (600 mm) below finished grade.
C. Remove concrete slabs on grade within site boundaries.
D. Remove fences and gates.
E. Remove other items indicated, for salvage, relocation, and recycling.
F. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Section 31 2200.
3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with other requirements specified in Section 01 7000.

B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Comply with applicable requirements of NFPA 241.
   3. Use of explosives is not permitted.
   4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   5. Provide, erect, and maintain temporary barriers and security devices.
   6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   8. Do not close or obstruct roadways or sidewalks without permit.
   9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
  10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

C. Do not begin removal until receipt of notification to proceed from Owner.

D. Protect existing structures and other elements that are not to be removed.
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

E. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

F. Perform demolition in a manner that maximizes salvage and recycling of materials.
   1. Comply with requirements of Section 01 7419 - Waste Management.
   2. Dismantle existing construction and separate materials.
   3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

3.03 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.
3.04 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.
B. Remove from site all materials not to be reused on site; comply with requirements of Section 01 7419 - Waste Management.
C. Leave site in clean condition, ready for subsequent work.
D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION
SECTION 03 0100
MAINTENANCE OF CONCRETE

PART 2  PRODUCTS

END OF SECTION
SECTION 04 0100
MAINTENANCE OF MASONRY

PART 1  GENERAL

1.01  SECTION INCLUDES
A. Water cleaning of masonry surfaces.
B. Repointing mortar joints.
C. Repair of damaged masonry.

1.02  RELATED REQUIREMENTS
A. Section 04 0511 - Mortar and Masonry Grout.
B. Section 04 2000 - Unit Masonry: Brick masonry units.
C. Section 04 2000 - Unit Masonry: Mortar and grout.
D. Section 04 4200 - Exterior Stone Cladding.

1.03  REFERENCE STANDARDS

1.04  SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on cleaning compounds.

1.05  QUALITY ASSURANCE
A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.
B. Restorer: Company specializing in masonry restoration with minimum three years of documented experience.

1.06  MOCK-UP
A. Restore and repoint an existing masonry wall area sized 8 feet (2.40 m) long by 6 feet (2 m) high; include in mock-up area instances of mortar, accessories, wall openings, and flashings.
B. Clean a 10 ft (3 m) by 10 ft (3 m) panel of wall to determine extent of cleaning.
C. Locate where agreed to by all parties.
D. Acceptable panel and procedures employed will become the standard for work of this section.
E. Mock-up may remain as part of the Work.

1.07  FIELD CONDITIONS
A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

PART 2  PRODUCTS

2.01  MANUFACTURERS
A. Restoration and Cleaning Chemicals:
   1. Substitutions: See Section 01 6000 - Product Requirements.

2.02  CLEANING MATERIALS
A. Cleaning Agent: Detergent type.
B. Cleaning Agent: 0.5 lb (227 g) of sodium hydrosulphite mixture to one gallon (3.8 L) of water.

2.03  MORTAR MATERIALS
A. Comply with requirements of Section 04 0511.
2.04 MASONRY MATERIALS
   A. Brick: Section 04 2000.
   B. Stone Veneer: Section 04 4200.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that surfaces to be cleaned are ready for work of this section.

3.02 PREPARATION
   A. Protect surrounding elements from damage due to restoration procedures.
   B. Carefully remove and store removable items located in areas to be restored, including fixtures, fittings, finish hardware, and accessories; reinstall upon completion.
   C. Separate areas to be protected from restoration areas using means adequate to prevent damage.
   D. Cover existing landscaping with tarpaulins or similar covers.
   E. Mask immediately adjacent surfaces with material that will withstand cleaning and restoration procedures.
   F. Close off adjacent occupied areas with dust proof and weatherproof partitions.
   G. Protect roof membrane and flashings from damage with 1/2 inch (13 mm) plywood laid on roof surfaces over full extent of work area and traffic route.
   H. When using cleaning methods that involve water or other liquids, install drainage devices to prevent runoff over adjacent surfaces unless those surfaces are impervious to damage from runoff.
   I. Do not allow cleaning runoff to drain into sanitary or storm sewers.

3.03 REBUILDING
   A. Cut out damaged and deteriorated masonry with care in a manner to prevent damage to any adjacent remaining materials.
   B. Support structure as necessary in advance of cutting out units.
   C. Cut away loose or unsound adjoining masonry as directed.
   D. Build in new units following procedures for new work specified in other section(s).
   E. Mortar Mix: Colored and proportioned to match existing work.
   F. Ensure that anchors are correctly located and built in.
   G. Install built in masonry work to match and align with existing, with joints and coursing true and level, faces plumb and in line. Build in all openings, accessories and fittings.

3.04 REPOINTING
   A. Perform repointing prior to cleaning masonry surfaces.
   B. Cut out loose or disintegrated mortar in joints to minimum 1/2 inch (6 mm) depth or until sound mortar is reached.
   C. Use power tools only after test cuts determine no damage to masonry units will result.
   D. Do not damage masonry units.
   E. When cutting is complete, remove dust and loose material by brushing.
   F. Premoisten joint and apply mortar. Pack tightly in maximum 1/4 inch (6 mm) layers. Form a smooth, compact concave joint to match existing.
   G. Moist cure for 72 hours.
3.05 CLEANING EXISTING MASONRY
A. Low Pressure Steam Cleaning: Apply _____ psi (100-400 kPa) pressure to masonry surfaces at designated locations, maintaining uniform depth and surface texture throughout.
B. Cleaning Detergent: Brush clean masonry surfaces at ______ locations with ______ type cleaning agent in accordance with the manufacturer’s instructions. Saturate masonry with clean water and flush loose mortar and dirt.

3.06 CLEANING NEW MASONRY
A. Verify mortar is fully set and cured.
B. Clean surfaces and remove large particles with wood scrapers, brass or nylon wire brushes.
C. Scrub walls with detergent type cleaning agent solution using stiff brush. Thoroughly rinse and wash off cleaning solution, dirt and mortar crumbs using clean, pressurized water.
D. Protect area below cleaning operation and keep masonry soaked with water and flushed free of acid and dissolved mortar continuously for duration of cleaning.

3.07 RESTORATION CLEANING
A. Clean surfaces and remove large particles with wood scrapers or non-ferrous wire brush.
B. Spray coat masonry with detergent restoration cleaner, mixed into solution in accordance with manufacturer’s instructions.
C. Provide a second application if required to match mock-up area.
D. Allow sufficient time for solution to remain on masonry and agitate with soft fiber brush or sponge.
E. Rinse from the bottom up with potable water applied at 400 psi (2 750 kPa) and at a rate of 4 gal/min (16 L/min).

3.08 AGING
A. Rub in new masonry work to match, as close as possible, adjacent original work.
   1. Use carbon black in small amounts, rubbing in well with burlap rags.

3.09 CLEANING
A. Immediately remove stains, efflorescence, or other excess resulting from the work of this section.
B. Remove excess mortar, smears, and droppings as work proceeds and upon completion.

END OF SECTION
SECTION 04 2000
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Concrete block.
B. Clay facing brick.
C. Mortar and grout.
D. Reinforcement and anchorage.
E. Flashings.
F. Lintels.
G. Accessories.

1.02 RELATED REQUIREMENTS
A. Section 04 0100 - Maintenance of Masonry.
B. Section 04 0511 - Mortar and Masonry Grout.
C. Section 06 1000 - Rough Carpentry: Nailing strips built into masonry.
D. Section 07 2100 - Thermal Insulation: Insulation for cavity spaces.
E. Section 07 2500 - WEATHER BARRIERS: Water-resistant barriers or air barriers applied to the exterior face of the backing sheathing or masonry.
F. Section 07 6200 - Sheet Metal Flashing and Trim: Through-wall masonry flashings.
G. Section 07 8400 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.
H. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.
I. Section 07 9005 - Joint Sealers: Backing rod and sealant at control and expansion joints.

1.03 PRICE AND PAYMENT PROCEDURES
A. See Section 01 2100 - Allowances, for cash allowances affecting this section.

1.04 REFERENCE STANDARDS
B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
F. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2014.

1.05 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
C. Samples: Submit four samples of decorative block units to illustrate color, texture, and extremes of color range.
D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE
A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS
A. Concrete Block: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depth of 8 inches (200 mm).
   2. Special Shapes: Provide non-standard blocks configured for corners.
   3. Load-Bearing Units: ASTM C90, normal weight.
      a. Hollow block, as indicated.
      b. Exposed Faces: Manufacturer's standard color and texture where indicated.

2.02 BRICK UNITS
A. Manufacturers:
B. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
   1. Nominal size: As indicated on drawings.
   2. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

2.03 MORTAR AND GROUT MATERIALS
A. Mortar and Grout: As specified in Section 04 0511.
B. Hydrated Lime: ASTM C207, Type S.
C. Grout Aggregate: ASTM C404.

2.04 REINFORCEMENT AND ANCHORAGE
A. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.
B. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch (16 mm) of mortar coverage from masonry face.
C. Two-Piece Wall Ties: Formed steel wire, 0.1875 inch (4.8 mm) thick, adjustable, eye and pintle type, hot dip galvanized to ASTM A 153/A 153M, Class B, sized to provide not less than 5/8 inch (16 mm) of mortar coverage from masonry face and to allow vertical adjustment of up to 1-1/4 in (32 mm).
2.05 FLASHINGS
A. Metal Flashing Materials:
   1. Stainless Steel Flashing: ASTM A666, Type 304, soft temper; 26 gage, 0.0187 inch (0.48 mm) thick; finish 2B to 2D.
   2. Prefabricated Metal Flashing: Smooth fabricated 12 oz/sq ft (3.66 kg/sq m) copper flashing for surface mounted conditions.
B. Membrane Asphaltic Flashing Materials:
   1. Rubberized Asphalt Flashing: Self-adhering polymer modified asphalt sheet; 40 mils (0.040 inch) (1.0 mm) minimum total thickness; 8 mil (0.20 mm) cross-laminated polyethylene bonded to adhesive rubberized asphalt, with a removable release liner.
      a. Manufacturers:
         1) Advanced Building Products, Inc; Strip-N-Flash: www.advancedbuildingproducts.com/#sle.
         3) York Manufacturing, Inc; York Seal: www.yorkmfg.com/#sle.

2.06 ACCESSORIES
A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
   1. Manufacturers:
      c. WIRE-BOND: www.wirebond.com/#sle.
B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.
C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
D. Weeps:
E. Type: Polyester mesh.
F. Color(s): As selected by Architect & Building Systems Engineer from manufacturer's full range.
   1. Manufacturers:
      c. CavClear/Archovations, Inc; www.cavclear.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.
G. Termite-Excluding Weep and Vent:
   1. Type: Polytetrafluoroethylene (PTFE) vent body with stainless-steel mesh closure.
   2. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.
   3. Stainless Steel Mesh: ASTM E11; opening size 0.018 inch (0.44 mm), maximum.
   4. Products:
H. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that field conditions are acceptable and are ready to receive masonry.
B. Verify that related items provided under other sections are properly sized and located.
C. Verify that built-in items are in proper location, and ready for roughing into masonry work.
3.02 PREPARATION
   A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
   B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COURSING
   A. Establish lines, levels, and coursing indicated. Protect from displacement.
   B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
   C. Concrete Masonry Units:
   D. Brick Units:

3.04 PLACING AND BONDING
   A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

3.05 WEEPS/CAVITY VENTS
   A. Install weeps in veneer and cavity walls at 24 inches (600 mm) on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

3.06 CAVITY MORTAR CONTROL
   A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

3.07 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY, AND CAVITY WALL MASONRY
   A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches (400 mm) on center.
   B. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches (900 mm) horizontally and 24 inches (600 mm) vertically.

3.08 MASONRY FLASHINGS
   A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
      1. Extend flashings full width at such interruptions and at least 6 inches (152 mm), minimum, into adjacent masonry or turn up flashing ends at least 1 inch (25.4 mm), minimum, to form watertight pan at non-masonry construction.
      2. Remove or cover protrusions or sharp edges that could puncture flashings.
   B. Extend plastic, laminated, EPDM, and ______ flashings to within 1/2 inch (12 mm) of exterior face of masonry and adhere to top of stainless steel angled drip with hemmed edge.

3.09 GROUTED COMPONENTS
   A. Lap splices minimum 24 bar diameters.
   B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.

3.10 CONTROL AND EXPANSION JOINTS
   A. Do not continue horizontal joint reinforcement through control or expansion joints.
   B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer’s instructions.

3.11 TOLERANCES
   A. Install masonry within the site tolerances found in TMS 402/602.
3.12 CUTTING AND FITTING
   A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.
   B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.13 FIELD QUALITY CONTROL
   A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

3.14 CLEANING
   A. Remove excess mortar and mortar droppings.
   B. Replace defective mortar. Match adjacent work.
   C. Clean soiled surfaces with cleaning solution.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Shop fabricated steel items.
   B. Downspout boots.

1.02 RELATED REQUIREMENTS
   A. Section 03 3000 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.
   B. Section 05 5213 - Pipe and Tube Railings.
   C. Section 07 7123 - Manufactured Gutters and Downspouts: Downspout boots.
   D. Section 09 9113 - Exterior Painting: Paint finish.
   E. Section 09 9123 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS
   E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.
   G. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
   I. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

1.04 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
      1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL
   A. Steel Sections: ASTM A 36/A 36M.
   B. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.
   C. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
D. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION
A. Fit and shop assemble items in largest practical sections, for delivery to site.
B. Fabricate items with joints tightly fitted and secured.
C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS
A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.
B. Lintels: As detailed; prime paint finish.

2.04 DOWNSPOUT BOOTS
A. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots, integral cleanout, cleanout cover, and tamper proof fasteners.
   2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.

2.05 FINISHES - STEEL
A. Prime paint steel items.
   1. Exceptions: Galvanize items to be embedded in concrete, items to be embedded in masonry, and items specified for _______ finish.
   2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
B. Prepare surfaces to be primed in accordance with SSPC-SP2.
C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
D. Prime Painting: One coat.
E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements.
F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION
A. Clean and strip primed steel items to bare metal where site welding is required.
B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 INSTALLATION
A. Install items plumb and level, accurately fitted, free from distortion or defects.
B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
C. Field weld components as indicated on drawings.
D. Perform field welding in accordance with AWS D1.1/D1.1M.
E. Obtain approval prior to site cutting or making adjustments not scheduled.
3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.
B. Maximum Offset From True Alignment: 1/4 inch (6 mm).
C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
A. Wall mounted handrails.
B. Stair railings and guardrails.
C. Free-standing railings at steps.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Handrails and Railings:
   2. KaneSterlingwww.sterlingdula.com/#sle.
B. Non-Weld Pipe Fittings:

2.02 RAILINGS - GENERAL REQUIREMENTS
A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.
B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot (1095 N/m) applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E 935.
C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds (890 N) applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E 935.

D. Allow for expansion and contraction of members and building movement without damage to connections or members.

E. Dimensions: See drawings for configurations and heights.

F. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

G. Provide slip-on non-weld mechanical fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.03 ALUMINUM MATERIALS

A. Aluminum Pipe: Schedule 40; ASTM B429/B429M, ASTM B241/B241M, or ASTM B483/B483M.

B. Non-Weld Mechanical Fittings: Slip-on cast aluminum, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.

C. Exposed Fasteners: No exposed bolts or screws.

2.04 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

2.05 ALUMINUM FINISHES

A. Where indicated as Clear Anodized provide Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils (0.018 mm) thick.

B. Superior Performance Organic Coating System: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system.

C. Color: To be selected by Architect & Building Systems Engineer from manufacturer's standard line.

D. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Apply one coat of bituminous paint to concealed aluminum surfaces that will be in contact with cementitious or dissimilar materials.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Anchor railings securely to structure.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch (6 mm).
C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural dimension lumber framing.
B. Non-structural dimension lumber framing.
C. Rough opening framing for doors, windows, and roof openings.
D. Sheathing.
E. Subflooding.
F. Preservative treated wood materials.
G. Miscellaneous framing and sheathing.
H. Communications and electrical room mounting boards.
I. Concealed wood blocking, nailers, and supports.

1.02 RELATED REQUIREMENTS

A. Section 01 7610 - Temporary Protective Coverings.
B. Section 07 2500 - WEATHER BARRIERS: Water-resistive barrier over sheathing.

1.03 REFERENCE STANDARDS

B. APA PRP-108 - Performance Standards and Qualification Policy for Structural-Use Panels (Form E445); 2001.
D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
G. PS 1 - Structural Plywood; 2009.
H. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
J. SPIB (GR) - Grading Rules; 2014.
K. WWPA G-5 - Western Lumber Grading Rules; 2011.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide technical data on insulated sheathing, wood preservative materials, and application instructions.
C. Structural Composite Lumber: Submit manufacturer's published structural data including span tables, marked to indicate which sizes and grades are being used; if structural composite lumber is being substituted for dimension lumber or timbers, submit grading agency structural tables marked for comparison.
D. Samples: For rough carpentry members that will be exposed to view, submit two samples, illustrating wood grain, color, and general appearance.
1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
   2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
   3. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Western Wood Products Association; WWPA G-5.
B. Sizes: Nominal sizes as indicated on drawings, S4S.
C. Moisture Content: S-dry or MC19.
D. Stud Framing (2 by 2 through 2 by 6 (50 by 50 mm through 50 by 150 mm)):
   1. Species: Any allowed under referenced grading rules and meeting requirements stipulated on the drawings or elsewhere in the project manual.
   2. Grade: No. 2.
E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.03 EXPOSED DIMENSION LUMBER

A. Grading Agency: Western Wood Products Association; WWPA G-5.
B. Sizes: Nominal sizes as indicated on drawings.
C. Surfacing: S4S.
D. Moisture Content: S-dry or MC19.

2.04 STRUCTURAL COMPOSITE LUMBER

A. At Contractor’s option, structural composite lumber may be substituted for concealed dimension lumber and timbers.
B. Structural Composite Lumber: Factory fabricated beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer.
   1. Beams: Use laminated veneer lumber, laminated strand lumber, or parallel strand lumber with manufacturer’s published E (modulus of elasticity): 1,800,000 psi (12,410 MPa), minimum.
   2. Manufacturers:

2.05 CONSTRUCTION PANELS

A. Subfloor/Underlayment Combination: Any PS 2 type, rated Single Floor.
   3. Performance Category: 3/4 PERF CAT.
   4. Thickness: 3/4 inches (19 mm), nominal.
5. Edges: Tongue and groove.

   3. Thickness: 3/4 inch (19 mm), nominal.

C. Roof Sheathing: APA PRP-108, Rated Sheathing, Exterior Exposure Class, and as follows:
   1. Span Rating: 24/0 (610/0).
   2. Thickness: 7/16” nominal.

D. Roof Sheathing: Oriented strand board wood structural panel; PS 2.
   1. Grade: Sheathing.
   2. Performance Category: 1/2 PERF CAT.
   4. Edges: Square with panel clips.
   5. Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 500 days.
   6. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches (406 mm) and 24 inches (610 mm) on center, respectively.
   7. Manufacturers:
      b. Substitutions: See Section 01 6000 - Product Requirements.

E. Wall Sheathing: APA PRP-108, Structural I Rated Sheathing, Exterior Exposure Class, and as follows:
   1. Span Rating: 24/0 (610/0).

F. Wall Sheathing: Oriented strand board structural wood panel; PS 2.
   2. Size: 4 feet (1219 mm) wide by 8 feet (2438 mm) long.
   3. Edge Profile: Square edge.

G. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch (19 mm) thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.06 ACCESSORIES

A. Fasteners and Anchors:
   2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.

B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
   1. For contact with preservative treated wood in exposed locations, provide minimum G185 (Z550) galvanizing complying with ASTM A653/A653M.

C. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.

D. Sill Gasket on Top of Foundation Wall: 1/4 inch (6 mm) thick, plate width, closed cell plastic foam from continuous rolls.

E. Subfloor Adhesives: Waterproof, air cure type, cartridge dispensed.

F. Water-Resistive Barrier: As specified in Section 07 2500.

2.07 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Preservative Treatment:
      a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
      b. Treat lumber exposed to weather.
      c. Treat lumber in contact with roofing, flashing, or waterproofing.
      d. Treat lumber in contact with masonry or concrete.

PART 3  EXECUTION

3.01  PREPARATION
   A. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

3.02  INSTALLATION - GENERAL
   A. Select material sizes to minimize waste.
   B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
   C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.
   D. Schedule framing and allocate manpower so that exposure to inclement weather is minimized in duration to prevent damage to framing materials that may occur from prolonged exposure to moisture, snow or wind. If necessary provide temporary protective coverings - see Section 01 7610 and 01 7000.

3.03  FRAMING INSTALLATION
   A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
   B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
   C. Install structural members full length without splices unless otherwise specifically detailed.
   D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.
   E. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches (38 mm) of bearing at each end.
   F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
   G. Provide bridging at joists in excess of 8 feet (2.3 m) span at mid-span. Fit solid blocking at ends of members.
   H. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04  BLOCKING, NAILERS, AND SUPPORTS
   A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
   B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
C. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

D. Provide the following specific non-structural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.
   7. Chalkboards and marker boards.
   8. Wall paneling and trim.
   9. Joints of rigid wall coverings that occur between studs.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.
B. Subflooring: Glue and nail to framing; staples are not permitted.
C. Space or gap subflooring in accordance with the manufacturer's instructions.
D. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
   1. At long edges provide solid edge blocking where joints occur between roof framing members.
   2. Nail panels to framing; staples are not permitted.
E. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails or screws.
   1. Provide 1/8" gap minimum between panel ends and edges. Use a spacer tool to assure accurate and consistent spacing.
   2. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.
F. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.
G. Wall Sheathing and Roof Sheathing with Laminated Water-Resistive Barrier and Air Barrier: Secure to studs as recommended by manufacturer.
   1. Install with laminated water-resistive and air barrier on exterior side of sheathing.
   2. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
   3. Use only mechanically attached and drainable EIFS and exterior insulation with wall sheathing with laminated water-resistive and air barrier.
   4. Apply manufacturer's standard seam tape to joints between sheathing panels. Use tape gun or hard rubber roller as recommended by manufacturer.

3.06 TOLERANCES

A. Framing Members: 1/4 inch (6 mm) from true position, maximum.
B. Surface Flatness of Floor: 1/8 inch in 10 feet (1 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.
C. Variation from Plane (Other than Floors): 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.
3.07 CLEANING

A. Waste Disposal: Comply with the requirements of Section 01 7419 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Wood I-joists for floor framing.
   B. Bridging, bracing, and anchorage.
   C. Framing for openings.

1.02 RELATED REQUIREMENTS
   A. Section 06 1000 - Rough Carpentry: Installation requirements for miscellaneous framing.

1.03 REFERENCE STANDARDS
   B. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.

1.04 DESIGN REQUIREMENTS
   A. As indicated on the drawings.

1.05 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Manufacturer's literature describing materials, dimensions, allowable spans and spacings, bearing and anchor details, bridging and bracing requirements, and installation instructions; identify independent inspection agency.
   C. Shop Drawings: Indicate sizes and spacing of joists, bracing and bridging, bearing stiffeners, holes to be cut (if any), and framed openings between joists.
   D. Certificate: Certification by joist manufacturer that products delivered are of the same design and construction as those evaluated by the independent inspection agency.

1.06 QUALITY ASSURANCE
   A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING
   A. Deliver products to site in manufacturer's original packaging with manufacturer's name and product identification intact and legible.
   B. Protect products from damage due to weather and breakage.
   C. Protect joists from warping or other distortion by stacking in upright position, braced to resist movement, with air circulation under coverings and around stacks.
   D. Handle individual joists in the upright position.

PART 2 PRODUCTS

2.01 MANUFACTURERS
   A. Wood I-Joists:
      4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS
   A. Wood I-Joists: Solid lumber top and bottom flanges and oriented strand board (OSB) webs bonded together with structural adhesive, with published span rating to meet project requirements.
1. Span Rating: Established and monitored in accordance with ASTM D5055 by independent inspection agency.
2. Oriented Strand Board: Comply with PS 2.
3. Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.
4. Depth: As indicated on drawings.
5. Fabrication Tolerances:
   a. Flange Width: Plus/minus 1/32 inch (0.8 mm).
   b. Flange Thickness: Minus 1/16 inch (1.6 mm).
   c. Joist Depth: Plus 0, minus 1/8 inch (3.2 mm).
6. Marking: Mark each piece with depth, joist spacing, and allowable span for joist spacing.

B. Wood-Based Components:
   1. Wood fabricated from old growth timber is not permitted.

C. Joist Bridging: Type, size and spacing recommended by joist manufacturer.

D. Fasteners: Electrogalvanized steel, type to suit application.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that supports and openings are ready to receive joists.

3.02 ERECTION
   A. Install joists in accordance with manufacturer's instructions.
   B. Set structural members level and plumb, in correct position.
   C. Make provisions for erection loads and for sufficient temporary bracing to maintain structure plumb and in true alignment until completion of erection and installation of permanent bracing.
   D. Install permanent bridging and bracing.
   E. Install headers and supports to frame openings required.
   F. Frame openings between joists with lumber in accordance with Section 06 1000.

3.03 TOLERANCES
   A. Framing Members: 1/2 inch (12 mm) maximum, from true position.

END OF SECTION
SECTION 06 1753
SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Shop fabricated wood trusses for roof and floor framing.
B. Bridging, bracing, and anchorage.

1.02 RELATED REQUIREMENTS
A. Section 06 1000 - Rough Carpentry: Installation requirements for miscellaneous framing.

1.03 REFERENCE STANDARDS
A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
C. SPIB (GR) - Grading Rules; 2014.

1.04 ADMINISTRATIVE REQUIREMENTS
A. Preinstallation Meeting: Convene one week before starting work of this section.
   1. Review preparation and installation procedures and coordinating and scheduling required with related work.
   2. Coordinate floor truss layout with MEP systems and Architectural intent for exterior wall penetrations.

1.05 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing.
   1. Include identification of engineering software used for design.
   2. Provide shop drawings stamped or sealed by design engineer.
   3. Provide layout of floor trusses paying special attention to MEP system coordination and Architectural intent for exterior wall penetrations by HVAC ducting.

1.06 QUALITY ASSURANCE
A. Designer Qualifications: Perform design by or under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Ohio.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Handle and erect trusses in accordance with TPI BCSI 1.
B. Store trusses in vertical position resting on bearing ends.

PART 2 PRODUCTS

2.01 TRUSSES
A. Wood Trusses: Designed and fabricated in accordance with TPI 1 and TPI DSB-89 to achieve structural requirements indicated.
   1. Connectors: Steel plate.
   2. Structural Design: Comply with applicable code for structural loading criteria.
   3. Floor Deflection: 1/360, maximum.

2.02 MATERIALS

A. Lumber:
   1. Moisture Content: Between 7 and 9 percent.
   2. Lumber fabricated from old growth timber is not permitted.

B. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G90/Z275 coating; die stamped with integral teeth; thickness as indicated.

C. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

2.03 ACCESSORIES

A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: Softwood lumber, any species, construction grade, 19 percent maximum and 7 percent minimum moisture content.

2.04 WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that supports and openings are ready to receive trusses.

3.02 PREPARATION

A. Coordinate placement of bearing items.

3.03 ERECTION

A. Install trusses in accordance with manufacturer's instructions and TPI DSB-89 and TPI BCSI 1; maintain a copy of each TPI document on site until installation is complete.

B. Set members level and plumb, in correct position.

C. Do not field cut or alter structural members without approval of Architect & Building Systems Engineer.

D. Install permanent bridging and bracing.

E. Frame openings between trusses with lumber in accordance with Section 06 1000.

3.04 TOLERANCES

A. Framing Members: 1/2 inch (12 mm) maximum, from true position.

END OF SECTION
SECTION 06 2000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Finish carpentry items.
B. Installation of wood door frames, glazed frames.
C. Wood casings and moldings.
D. Installation of hardware and attachment accessories.
E. Installation of window sills.

1.02 RELATED REQUIREMENTS
A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.
B. Section 06 4100 - Architectural Wood Casework: Shop fabricated custom cabinet work.
C. Section 09 9123 - Interior Painting: Painting of finish carpentry items.
D. Section 12 3530 - Residential Casework: Shop fabricated cabinet work.

1.03 REFERENCE STANDARDS
C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

1.05 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements for submittal procedures.
B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
   2. Include certification program label.
C. Samples: Submit one sample of wood trim 4 inch (101.6 mm) long.
D. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

1.06 QUALITY ASSURANCE
A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
   1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
B. Quality Certification:
   1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
   2. Provide labels or certificates indicating that the work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   3. Provide designated labels on shop drawings as required by certification program.
   4. Provide designated labels on installed products as required by certification program.
5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.07 DELIVERY, STORAGE, AND HANDLING
   A. Protect work from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTERY ITEMS
   A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
   B. Exterior Woodwork Items:
      C. Cellular PVC Trim: Extruded, expanded PVC; UV-resistant, heat-stabilized, and rigid material.
         1. Density: 31 pounds per cubic foot (500 kg/cu m), minimum.
         2. Composition: Cellular PVC formulation.
         3. Finishes: Natural White, painted in accordance with manufacturer's specification and instructions.
         4. Surface Patterns: Smooth
         5. Trimboard sizes: See drawings. a
         7. Manufacturers:
            a. AZEK Building Products, Inc; Traditional Trim: www.azek.com/#sle.
            b. CertainTeed Certa Trim, www.certainteed.com
   D. Interior Woodwork Items: (see drawings for wood species and finish)

2.02 WOOD-BASED COMPONENTS
   A. Wood fabricated from old growth timber is not permitted.

2.03 FASTENINGS
   A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.
   B. Fasteners: Of size and type to suit application; concealed.

2.04 FABRICATION
   A. Shop assemble work for delivery to site, permitting passage through building openings.
   B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify adequacy of backing and support framing.

3.02 INSTALLATION
   A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
   B. Set and secure materials and components in place, plumb and level.
   C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim to conceal larger gaps.
   D. PVC trim products:
      1. Install in accordance with the manufacturer's published installation instructions.
      2. Allow for expansion and contraction in accordance with manufacturer's installation instructions.
3. Use fastener’s recommended by the manufacturer for the application and substrate of project. Install in strict compliance with manufacturer instructions. All fasteners shall be set and filled.

3.03 PREPARATION FOR SITE FINISHING
   A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

3.04 TOLERANCES
   A. Maximum Variation from True Position: 1/16 inch (1.6 mm).
   B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.79 mm).

END OF SECTION
SECTION 06 4100
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Specially fabricated cabinet units.
B. Hardware.

1.02 RELATED REQUIREMENTS
A. Section 12 3600 - Countertops.

1.03 REFERENCE STANDARDS
A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
C. Product Data: Provide data for hardware accessories.

1.05 QUALITY ASSURANCE
A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Protect units from moisture damage.

1.07 FIELD CONDITIONS
A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 CABINETS
A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
B. Wood Veneer Faced Cabinet:
C. Plastic Laminate Faced Cabinets: Custom grade.
D. Cabinets at Living Units:
   2. Finish - Concealed Surfaces: Manufacturer's option.
   3. Casework Construction Type: Type B - Face-frame.
   4. Interface Style for Cabinet and Door: Style 1 - Overlay; Full Overlay.
   5. Cabinet Style: Flush overlay.
   7. Drawer Side Construction: Multiple-dovetailed.

2.02 WOOD-BASED COMPONENTS
A. Wood fabricated from old growth timber is not permitted.
2.03 COUNTERTOPS
A. Countertops are specified in Section 12 3600.

2.04 HARDWARE
A. Adjustable Shelf Supports: Standard back-mounted system using surface mounted metal shelf standards and coordinated cantilevered shelf brackets, satin chrome finish, for nominal 1 inch (25 mm) spacing adjustments.
B. Drawer and Door Pulls:
   1. Product: CONTEMPORARY METAL PULL - 3486, BRUSHED NICKEL, 96mm manufactured by Richelieu.
C. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with satin finish. Where shown on drawings.
D. Drawer Slides:
   1. Type: Extension types as indicated.
   2. Static Load Capacity: Commercial grade.
   4. Stops: Integral type.
   5. Manufacturers:
E. Hinges: European style concealed self-closing type, steel with polished finish.
   1. Manufacturers:
      a. Grass America Inc; Tiomos Hinge System: www.grassusa.com/#sle.
      e. Substitutions: See Section 01 6000 - Product Requirements.

2.05 FABRICATION
A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
C. Matching Wood Grain: Comply with requirements of quality standard for specified Grade and as follows:
   1. Provide center matched panels at each elevation.

2.06 SHOP FINISHING
A. Sand work smooth and set exposed nails and screws.
B. For opaque finishes, apply wood filler in exposed nail and screw indentations and sand smooth.
C. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.
D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. Stain: As selected by Architect & Building Systems Engineer.
      b. Sheen: Semigloss.
   2. Opaque: (where indicated)
      a. System - 1, Lacquer, Nitrocellulose.
      b. Color: As selected by Architect & Building Systems Engineer.
      c. Sheen: Semigloss.
PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify adequacy of backing and support framing.
   B. Verify field measurements.

3.02 INSTALLATION
   A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
   B. Use fixture attachments in concealed locations for wall mounted components.
   C. Use concealed joint fasteners to align and secure adjoining cabinet units.
   D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim for this purpose.
   E. Secure cabinets to floor using appropriate angles and anchorages.
   F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 CLEANING
   A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Sheet Waterproofing:

1.02 RELATED REQUIREMENTS
   A. Section 03 3000 - Cast-in-Place Concrete: Concrete substrate.

1.03 REFERENCE STANDARDS
   P. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a (Reapproved 2013).

1.04 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Provide data for membrane.
   C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
   D. Manufacturer's Installation Instructions: Indicate special procedures.
E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner’s name and registered with manufacturer.

1.05 QUALITY ASSURANCE
A. Membrane Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 FIELD CONDITIONS
A. Maintain ambient temperatures above 40 degrees F (5 degrees C) for 24 hours before and during application and until liquid or mastic accessories have cured.

1.07 WARRANTY
A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS
2.01 MEMBRANE MATERIALS
2.02 ACCESSORIES
A. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrates and waterproofing materials.
B. Flexible Flashings: Type recommended by membrane manufacturer.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify existing conditions are acceptable prior to starting this work.
B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.
C. Verify items that penetrate surfaces to receive waterproofing are securely installed.

3.02 PREPARATION
A. Protect adjacent surfaces from damage not designated to receive waterproofing.
B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer’s instructions; vacuum substrate clean.
C. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.
D. Seal cracks and joints with sealant using depth to width ratio as recommended by sealant manufacturer.
E. Surfaces for Adhesive Bonding: Apply surface conditioner at a rate recommended by manufacturer, and protect conditioner from rain or frost until dry.
F. Concrete Surfaces for Adhesive Bonding: Prepare concrete substrate according to ASTM D5295/D5295M.
   1. Remove substances that inhibit adhesion including form release agents, curing compounds admixtures, laitance, moisture, dust, dirt, grease and oil.
   2. Repair surface defects including honeycombs, fins, tie holes, bug holes, sharp offsets, rutted cracks, ragged corners, deviations in surface plane, spalling and delaminations, as described in the reference standard.
   3. Remove and replace areas of defective concrete as specified in Section 03 3000.
   4. Prepare concrete for adhesive bonded waterproofing using mechanical or chemical methods described in the referenced standard.
   5. Test concrete surfaces as described in the referenced standards. Verify surfaces are ready to receive adhesive bonded waterproofing membrane system.
3.03 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.
B. Roll out membrane, and minimize wrinkles and bubbles.
C. Self-Adhering Membrane: Remove release paper layer, and roll out onto substrate with a mechanical roller to provide full contact bond.
D. Overlap edges and ends, minimum 3 inches (76 mm), seal permanently waterproof by method recommended by manufacturer, and apply uniform bead of sealant to joint edge.
E. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.
F. Weather lap joints on sloped substrate in direction of drainage, and seal joints and seams.
G. Flexible Flashings: Seal items watertight that penetrate through waterproofing membrane with flexible flashings.
H. Seal membrane and flashings to adjoining surfaces.

3.04 INSTALLATION - DRAINAGE PANEL AND PROTECTION BOARD

A. Place protection board directly against drainage panel; butt joints. Scribe and cut boards around projections, penetrations, and interruptions.
B. Adhere protection board to substrate with compatible adhesive.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation and integral vapor retarder at cavity wall construction, perimeter foundation wall, underside of floor slabs, over roof deck, over roof sheathing, and interior wall with facer providing exposed finish.
B. Batt insulation in exterior wall, ceiling, and roof construction.
C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

A. Section 07 2500 - WEATHER BARRIERS: Separate air barrier and vapor retarder materials.

1.03 REFERENCE STANDARDS


1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.
PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 APPLICATIONS

2.03 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Complies with ASTM C578 with either natural skin or cut cell surfaces.
   1. Flame Spread Index (FSI): Class B - 26 to 75, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   3. Type and Thermal Resistance, R-value (RSI-value): Type IV, 5.0 (0.88) per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.
   4. Complies with fire resistance requirements shown on the drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
   5. Board Thickness: 1-1/2 inches (37.5 mm).
   6. Manufacturers:

2.04 BATT INSULATION MATERIALS

A. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor’s option; unless specifically indicated one or the other.

B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   5. Manufacturers:

C. Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
   1. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.

2.05 ACCESSORIES

A. Sheet Vapor Retarder: Specified in Section 07 2500.

B. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch (50 mm) wide.

C. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

D. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.

E. Adhesive: Type recommended by insulation manufacturer for application.

F. Spray foam insulation: Non-expanded foam spray for application into cracks around exterior doors and windows, closely spaced framing members, holes and penetrations.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 GENERAL
A. Provide complete insulation package for proposed structure including foundation, walls, floors, attics and any assembly exposed to the exterior.
B. Insulate all crevices at exterior openings and penetrations either with batt insulation or non expanding foam.
C. Fill all holes in top and bottom wall plates of attics and crawl spaces with nonexpanding foam.

3.03 BOARD INSTALLATION AT FOUNDATION PERIMETER

3.04 BATT INSTALLATION
A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
E. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches (150 mm) on center. Lap and seal sheet retarder joints over member face.
F. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over member face.
G. Tape seal tears or cuts in vapor retarder.
H. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

3.05 FIELD QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements, for additional requirements.

3.06 PROTECTION
A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION
SECTION 07 2126
BLOWN INSULATION

PART 1 GENERAL

1.01 REFERENCE STANDARDS

1.02 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Provide data on product characteristics, performance criteria, and limitations.
   C. Manufacturer's Installation Instructions: Indicate procedure for preparation and installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS
   A. Blown Insulation:

2.02 MATERIALS
   A. Applications: Provide blown insulation in attic, exterior walls, and ceiling as indicated on drawings.
   B. Loose Fill Insulation: ASTM C739, cellulose fiber type, bulk for pneumatic placement.
      1. Thermal Transmittance (U-value): 0.27 BTU/hr sq ft deg F (0.0389 W/sq m K), maximum.
      2. Installed Thickness: As indicated on drawings to achieve required R Value indicated.
   C. Ventilation Baffles: Formed plastic.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that substrate and adjacent materials are dry and ready to receive insulation.
   B. Verify that light fixtures have thermal cut-out device to restrict over-heating in soffit or ceiling spaces.
   C. Verify spaces are unobstructed to allow for proper placement of insulation.

3.02 INSTALLATION
   A. Install insulation and ventilation baffle in accordance with ASTM C1015 and manufacturer’s instructions.
   B. Completely fill intended spaces leaving no gaps or voids.

3.03 CLEANING
   A. Remove loose insulation residue.

END OF SECTION
SECTION 07 2500
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Water-Resistive Barrier: Under exterior wall cladding, over sheathing or other substrate; not air tight or vapor retardant.
B. Vapor Retarders: Materials to make exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls water vapor resistant and air tight.
C. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

1.02 RELATED REQUIREMENTS
A. Section 07 9005 - Joint Sealers: Sealant materials and installation techniques.

1.03 DEFINITIONS
A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.
B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.
C. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
1. Water Vapor Permeance: For purposes of conversion, 57.2 ng/(Pa s sq m) = 1 perm.
D. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture resistant, to the degree specified, intended to be installed to shed water without sealed seams.

1.04 REFERENCE STANDARDS

1.05 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on material characteristics.

PART 2 PRODUCTS

2.01 WEATHER BARRIER ASSEMBLIES
A. Water-Resistive Barrier: Provide on exterior walls under exterior cladding.
   1. Use product specified in section 2.02 unless otherwise indicated.
   2. Under Portland cement stucco, or cultured stone use two separate layers of building paper.
B. Air Barrier:
   1. On outside surface of inside wythe of exterior masonry cavity walls use air barrier coating.
2. On outside surface of sheathing of exterior walls use air barrier sheet, mechanically fastened type.

C. Interior Vapor Retarder:
   1. On inside face of studs of exterior walls, under cladding, use mechanically fastened vapor retarder sheet.

2.02 WATER-RESISTIVE BARRIER MATERIALS (NEITHER AIR BARRIER OR VAPOR RETARDER)
A. Building Paper: Asphalt-saturated Kraft building paper complying with requirements of ICC-ES AC38 Grade D.
   1. Water Penetration Resistance: Withstand a water head of 21 inches (55 cm), minimum, for minimum of five hours, when tested in accordance with AATCC Test Method 127.

2.03 AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)
A. Air Barrier Sheet, Mechanically Fastened:
   1. Air Permeance: 0.004 cubic feet per minute per square foot (0.02 L/s/sq m), maximum, when tested in accordance with ASTM E2178.
   2. Water Vapor Permeance: 5 perms (286 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M Procedure A (desiccant procedure).
   3. Water Penetration Resistance: Withstand a water head of 21 inches (55 cm), minimum, for minimum of 5 hours, when tested in accordance with AATCC Test Method 127.
   4. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 180 days of weather exposure.
   5. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, when tested in accordance with ASTM E84.
   7. Seam and Perimeter Tape: Polyethylene self adhering type, mesh reinforced, 2 inches (50 mm) wide, compatible with sheet material; unless otherwise specified.
   8. Manufacturers:
      c. Substitutions: See Section 01 6000 - Product Requirements.

2.04 VAPOR RETARDER MATERIALS (AIR BARRIER AND WATER-RESISTIVE)
A. Vapor Retarder Sheet: Type: Dynamic permeability sheeting.
   1. Water Vapor Permeance: dynamic ranging from 1.0 to 10 perms varying with prevailing relative humidity levels; when tested in accordance with ASTM E96/E96M.
   2. Fire resistance: Class A, max smoke development 85, meeting ASTM E84.
   3. Seam and Perimeter Tape: As recommended by sheet manufacturer.
   4. Manufacturers:
      a. Membrain as manufactured by Certainteed Saint-Gobain.
      b. Intello Plus as provided by 475 High Performance Building Supply.

2.05 SEALANTS
A. Butyl Sealant: as specified in Section 07 9005.

2.06 ADHESIVES
A. Mastic Adhesive: Compatible with sheet seal and substrate, thick mastic of uniform knife grade consistency.

2.07 ACCESSORIES
   2. Manufacturers:
d. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION
A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

3.03 INSTALLATION
A. Install materials in accordance with manufacturer’s instructions.
B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.
C. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
D. Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
   1. All seams, tears or punctures shall be taped.
   2. Seal top and bottom of vapor retarder with continuous bead of sealant.
E. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.
F. Mechanically Fastened Sheets - On Exterior:
   1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
   2. Overlap seams as recommended by manufacturer but at least 6 inches.
   3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches (305 mm).
   4. For applications specified to be air tight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners recommended by the manufacturer.
   5. Install water-resistive barrier over jamb flashings.
   6. Install air barrier and vapor retarder UNDER jamb flashings.
   7. Install head flashings under weather barrier.
   8. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.
G. Mechanically Fastened Sheets - Vapor Retarder On Interior:
   1. When insulation is to be installed in assembly, install vapor retarder over insulation.
   2. Anchor to wood framing using large-headed nails or staples at 12 to 18 inches (305 to 460 mm) on center along each framing member covered; cover fasteners with seam tape.
   4. Locate laps at a framing member; at laps fasten one sheet to framing member then tape overlapping sheet to first sheet.
   5. Seal entire perimeter to structure, window and door frames, and other penetrations.
   6. Where conduit, pipes, wires, ducts, outlet boxes, and other items are installed in insulation cavity, pass vapor retarder sheet behind item but over insulation and maintain air tight seal.
H. Self-Adhered Sheets:
   1. Prepare substrate in manner recommended by sheet manufacturer; fill and tape joints in substrate and between dissimilar materials.
   2. Lap sheets shingle-fashion to shed water and seal laps air tight.
3. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that laps are firmly adhered with no gaps or fishmouths.
4. Use same material, or other material approved by sheet manufacturer for the purpose, to seal to adjacent construction and as flashing.
5. At wide joints, provide extra flexible membrane allowing joint movement.

I. Openings and Penetrations in Exterior Weather Barriers:
   1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches (125 mm) onto weather barrier and at least 6 inches (150 mm) up jambs; mechanically fasten stretched edges.
   2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches (100 mm) wide; do not seal sill flange.
   3. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches (230 mm) wide, covering entire depth of framing.
   4. At head of openings, install flashing under weather barrier extending at least 2 inches (50 mm) beyond face of jambs; seal weather barrier to flashing.
   5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
   6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 FIELD QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements, for additional requirements.
B. Coordination of ABAA Tests and Inspections:
   1. Provide testing and inspection required by ABAA QAP.
   2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
   3. Cooperate with ABAA testing agency.
   4. Allow access to air barrier work areas and staging.
   5. Do not cover air barrier work until tested, inspected, and accepted.
C. Take digital photographs of each portion of the installation prior to covering up.

3.05 PROTECTION
A. Do not leave materials exposed to weather longer than recommended by manufacturer.
B. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

END OF SECTION
SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL
1.01 SECTION INCLUDES
   A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, and aluminum wrapped trim / fascias.
   B. Aluminum soffits.
   C. Sealants for joints within sheet metal fabrications.
   D. Precast concrete splash pads.

1.02 RELATED REQUIREMENTS
   A. Section 04 2000 - Unit Masonry: Metal flashings embedded in masonry.
   B. Section 06 1000 - Rough Carpentry: Field fabricated roof curbs.
   C. Section 07 3113 - Asphalt Shingles: Non-metallic flashings associated with shingle roofing.
   D. Section 07 7200 - Roof Accessories: Manufactured metal roof curbs.
   E. Section 07 9200 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

1.03 REFERENCE STANDARDS
   C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

1.04 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
   C. Samples: Submit one sample illustrating metal finish color.

1.05 QUALITY ASSURANCE
   A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

1.06 DELIVERY, STORAGE, AND HANDLING
   A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
   B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS
2.01 SHEET MATERIALS
   A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch (0.6 mm) thick base metal, shop pre-coated with PVDF coating.
1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
2. Color: As selected by Architect & Building Systems Engineer from manufacturer's standard colors.

B. Aluminum: ASTM B209 (ASTM B209M); 20 gage, (0.032 inch) (0.81 mm) thick; anodized finish of color as selected.

C. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); [.063] inch thick; plain finish shop pre-coated with fluoropolymer coating
   1. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: As selected by Architect & Building Systems Engineer from manufacturer's standard colors.

2.02 ACCESSORIES
A. Fasteners: Same material and finish as flashing metal.
B. Sealant: Type as specified in Section 07 9005.

2.03 FABRICATION
A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
B. Form pieces in longest possible lengths.
C. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.
D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
E. Fabricate corners from one piece with minimum 18 inch (450 mm) long legs; seam for rigidity, seal with sealant.
F. Fabricate flashings to allow toe to extend 2 inches (50 mm) over roofing gravel. Return and brake edges.

2.04 GUTTER AND DOWNSPOUT FABRICATION
A. Gutters: Profile as indicated.
B. Downspouts: Profile as indicated.
C. Gutters and Downspouts: Size indicated.
D. Accessories: Profiled to suit gutters and downspouts.
   1. Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
   2. Gutter Supports: Spikes and ferrules.
   4. Valley splash guards: Prefinished aluminum in same gage as gutters secured to outer edge of 90 degree inside corners at bottom of roof valleys. Secure to inside face of outer gutter edge to form a 90 degree ‘L’ approximately 6" in height with chamfered top corners.
E. Splash Pads: Precast concrete or solid plastic type, of size and profiles indicated; minimum 3000 psi (21 MPa) at 28 days, with minimum 5 percent air entrainment.
F. Downspout Boots: Plastic.
G. Downspout Extenders: Same material and finish as downspouts.
H. Seal metal joints.

2.05 VINYL SOFFITS
A. Profile: Board Style, Ventilating Triple 3-Inch; 3-1/3 inches wide, solid; 9 inch exposure; with hidden vents. Basis of design is Certainteed Vinyl Carpentry Triple 3-1/3” InvisiVent Super Ventilated Soffit providing 10.0 square inches of net free ventilation per square ft.
PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
   B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION
   A. Install starter and edge strips, and cleats before starting installation.
   B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil (0.4 mm).

3.03 INSTALLATION
   A. Comply with drawing details.
   B. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.
   C. Apply plastic cement compound between metal flashings and felt flashings.
   D. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
   E. Seal metal joints watertight.
   F. Secure gutters and downspouts in place with concealed fasteners.
   G. Connect downspouts to downspout boots, and grout connection watertight.
   H. Set splash pads under downspouts.

END OF SECTION
SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL

1.01 RELATED REQUIREMENTS
A. Section 07 8100 - Applied Fireproofing.

1.02 REFERENCE STANDARDS
F. ITS (DIR) - Directory of Listed Products; current edition.
H. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

1.03 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
C. Product Data: Provide data on product characteristics, performance ratings, and limitations.
D. Sustainable Design Submittal: Submit VOC content documentation for all non-preformed materials.
E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
G. Certificate from authority having jurisdiction indicating approval of materials used.
H. Installer Qualification: Submit qualification statements for installing mechanics.

1.04 QUALITY ASSURANCE
A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated, ASTM E119, and ASTM E814.
   1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
   2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
   3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
C. Installer Qualifications: Company specializing in performing the work of this section and:
1. Verification of minimum three years documented experience installing work of this type.

D. Coordination: Cross-coordinate rated and structural assemblies with penetrating products shown on plans and shop drawings of work by other divisions.

1.05 FIELD CONDITIONS
A. Comply with firestopping manufacturer’s recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS
2.01 MATERIALS
A. Manufacturers:
   2. 3M Fire Protection Products: www.3m.com/firestop.

B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.

C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

D. Fire Ratings: Refer to drawings for required systems and ratings.

2.02 FIRESTOPPING ASSEMBLY REQUIREMENTS
A. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
   1. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

B. Membrane Penetration Firestopping: For all membrane penetrations, provide firestopping systems that have been tested according to ASTM E814 to have a pressure differential of .01" of water, and with fire resistance, F and T Rating not less than the required fire rating of penetrated assembly.

C. Non-standard firestopping applications: for plumbing cleanouts, electrical panels, and other non-standard penetrations in rated and/or structural bearing wall membranes, provide listed systems with supporting fire engineering determination for modifications and submit for approval to local building and fire authorities.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION
A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to prevent liquid material from leakage.

3.03 INSTALLATION
A. Install materials in manner described in fire test report and in accordance with manufacturer’s instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

C. Install labeling required by code.
3.04 FIELD QUALITY CONTROL
   A. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.05 CLEANING
   A. Clean adjacent surfaces of firestopping materials.

3.06 PROTECTION
   A. Protect adjacent surfaces from damage by material installation.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
A. Nonsag gunnable joint sealants.
B. Joint backings and accessories.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.
C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
D. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect & Building Systems Engineer and submit at least two physical samples for verification of color of each required sealant.

1.04 WARRANTY
A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
B. Correct defective work within a five year period after Date of Substantial Completion.
C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.

2.02 JOINT SEALANT APPLICATIONS
A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
a. Wall expansion and control joints.
b. Joints between door, window, and other frames and adjacent construction.
c. Joints between different exposed materials.
d. Openings below ledge angles in masonry.
e. Other joints indicated below.

2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
a. Joints between door, window, and other frames and adjacent construction.
b. Other joints indicated below.

3. Do not seal the following types of joints.
a. Intentional weepholes in masonry.
b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
d. Joints where installation of sealant is specified in another section.
e. Joints between suspended panel ceilings/grid and walls.

B. Type E-1 - Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.

C. Type ___ - Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
2. Type I-3 - Floor Joints in Wet Areas: Non-sag polyurethane "non-traffic-grade" sealant suitable for continuous liquid immersion.
3. Type I-4 - Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; clear or white as selected by Architect.

D. Interior Wet Areas: Bathrooms, restrooms, kitchens, food service areas, and food processing areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, other similar items.

2.03 JOINT SEALANTS - GENERAL
A. Sealants and Primers: Provide products with levels of volatile organic compound (VOC) content as indicated in Section 01 6116.

2.04 NONSAG JOINT SEALANTS
A. Type E-1 - Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: 30%, minimum.
2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
5. Manufacturers:
c. Sika Corporation; Sikasil 728NS: www.usa-sika.com/#sle.
d. Tremco Commercial Sealants & Waterproofing; Spectrem 1: www.tremcosealants.com/#sle.

B. Type I-4 - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
2. Manufacturers:
C. Type I-1 - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
   2. Color: Match adjacent finished surfaces.
   3. Manufacturers:

D. Type I-3 - Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface.
   1. Movement Capability: Plus and minus 35 percent, minimum.
   2. Color: Match adjacent finished surfaces.
   3. Manufacturers:

E. Type I-2 - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
   1. Color: Standard colors matching finished surfaces, Type OP (opaque).
   2. Grade: ASTM C834; Grade - Minus 18 Degrees C.
   3. Manufacturers:

2.05 ACCESSORIES
   A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
      1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
      2. Open Cell: 40 to 50 percent larger in diameter than joint width.
   B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

PART 3 EXECUTION
3.01 EXAMINATION
   A. Verify that joints are ready to receive work.
   B. Verify that backing materials are compatible with sealants.
   C. Verify that backer rods are of the correct size.

3.02 PREPARATION
   A. Remove loose materials and foreign matter that could impair adhesion of sealant.
   B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
   C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
   D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION
   A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
B. Perform installation in accordance with ASTM C1193.
C. Install bond breaker backing tape where backer rod cannot be used.
D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
E. Do not install sealant when ambient temperature is outside manufacturer’s recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
F. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 POST-OCCUPANCY
A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width; i.e. at low temperature in thermal cycle. Report failures immediately and repair.

END OF SECTION
SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 2 PRODUCTS

1.01 DESIGN CRITERIA
A. Requirements for Hollow Metal Doors and Frames:
   1. Steel used for fabrication of doors and frames shall comply with one or more of the following requirements; Galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, Commercial Steel (CS) Type B for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
   3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
   4. Door Edge Profile: steel.
   5. Typical Door Face Sheets: 2 panel.
   7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
   8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
      a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.
B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

1.02 HOLLOW METAL DOORS
A. Exterior Doors: Thermally insulated.
   1. Therma Tru SE969HD 90 minute thermally insulated steel door.
   2. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level heavy duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 2 panel.
      d. Door Face Metal Thickness: 20 gage, 0.032 inch (0.8 mm), minimum.
   3. Door Thickness: 1-3/4 inch (44.5 mm), nominal.

1.03 HOLLOW METAL FRAMES
A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
B. Exterior Door Frames: Face welded type.
   2. Weatherstripping: Separate, see Section 08 7100.

1.04 FINISHES
A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

1.05 ACCESSORIES
A. Louvers: Roll formed steel with overlapping frame; finish same as door components; factory-installed.
B. Glazing: As specified in Section 08 8000, factory installed.

C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

D. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

E. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

F. Threshold: Therma Tru barrier free/ADA compliant.

END OF SECTION
SECTION 08 1416
FLUSH WOOD DOORS

A. Painted hardboard (factory finish - IE LEGACY).

PART 2 PRODUCTS

1.01 DOORS AND PANELS
A. Doors: Refer to drawings for locations and additional requirements.
   1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with WDMA I.S. 1A.
B. Interior Doors: 1-3/4 inches (44 mm) thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at each location.
   2. Hardboard facing with factory opaque finish as indicated on drawings.

1.02 DOOR AND PANEL CORES
A. Hollow Core Doors: Type - Standard (FSHC); plies and faces as indicated above.

1.03 DOOR FACINGS
A. Hardboard Facing: Factory applied masonite legacy wood grain finish; color as selected by Architect.

1.04 DOOR CONSTRUCTION
A. Fabricate doors in accordance with door quality standard specified.
B. Cores Constructed with stiles and rails:
   1. Provide solid blocks at lock edge for hardware reinforcement.
C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
E. Provide edge clearances in accordance with the quality standard specified.

1.05 FACTORY FINISHING - WOOD VENEER DOORS
A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Sheen: Satin.
B. Finish work in accordance with WDMA I.S. 1A for grade specified and as follows:
C. Factory finish doors in accordance with approved sample.

END OF SECTION
SECTION 08 7100
DOOR HARDWARE

PART 2 PRODUCTS

1.01 DESIGN AND PERFORMANCE CRITERIA

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Provide door hardware products that comply with the following requirements:
   1. Applicable provisions of federal, state, and local codes.
   2. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
   3. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), testing firm acceptable to authorities having jurisdiction, or _____ as suitable for application indicated.

1.02 FINISHES

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in contract documents that are receiving the following types of floor coverings:
   1. Resilient tile and sheet.
   2. Broadloom carpet.
   3. Carpet tile.
   4. Thin-set ceramic tile and stone tile.
B. Preparation of new and existing concrete floor slabs for installation of floor coverings.
C. Testing of concrete floor slabs for moisture and alkalinity (pH).
D. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
   1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.
E. Patching compound.
F. Remedial floor coatings.
G. Remedial floor sheet membrane.
H. Preparation of new and existing wood-based floors and subfloors for installation of new floor coverings.

1.02 REFERENCE STANDARDS

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.04 SUBMITTALS

A. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.
B. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Moisture and alkalinity (pH) test reports.
   5. Recommendations for remediation of unsatisfactory surfaces.
7. Submit report not more than two business days after conclusion of testing.

C. Adhesive Bond and Compatibility Test Report.

1.05 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
   1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

C. Contractor's Responsibility Relating to Independent Agency Testing:
   1. Provide access for and cooperate with testing agency.
   2. Confirm date of start of testing at least 10 days prior to actual start.
   3. Allow at least 4 business days on site for testing agency activities.
   4. Achieve and maintain specified ambient conditions.
   5. Notify Architect & Building Systems Engineer when specified ambient conditions have been achieved and when testing will start.

D. Remedial Coating Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 3 years' experience installing moisture emission coatings.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

1.07 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F (18 degrees C) or more than 85 degrees F (30 degrees C).

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
   1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
   2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
   1. Preliminary cleaning.
   2. Moisture vapor emission tests; 3 tests in the first 1000 square feet (100 square meters) and one test in each additional 1000 square feet (100 square meters), unless otherwise indicated or required by flooring manufacturer.
3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
4. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
5. Specified remediation, if required.
6. Patching, smoothing, and leveling, as required.
7. Other preparation specified.
9. Protection.

B. Remediations:
   1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
   2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.
   3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.02 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.03 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet (1.4 kg per 93 square meters) per 24 hours.

F. Report: Report the information required by the test method.

3.04 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F2170 Procedure A and as follows.

D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.
F. Report: Report the information required by the test method.

3.05 ALKALINITY TESTING
   A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
   B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.
   C. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.
   D. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch (25 mm) in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.
   E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.06 PREPARATION
   A. See individual floor covering section(s) for additional requirements.
   B. Comply with requirements and recommendations of floor covering manufacturer.
   C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
   D. Do not fill expansion joints, isolation joints, or other moving joints.

3.07 ADHESIVE BOND AND COMPATIBILITY TESTING
   A. Comply with requirements and recommendations of floor covering manufacturer.

END OF SECTION
SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Performance criteria for gypsum board assemblies.
   B. Acoustic insulation.
   C. Gypsum sheathing.
   D. Cementitious backing board.
   E. Gypsum wallboard.
   F. Joint treatment and accessories.
   G. Textured finish system.

1.02 RELATED REQUIREMENTS
   A. Section 07 2500 - WEATHER BARRIERS: Water-resistive barrier over sheathing.

1.03 REFERENCE STANDARDS
   F. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2014.
   O. ASTM E413 - Classification for Rating Sound Insulation; 2010.
   Q. GA-226 - Application of Gypsum Board to Form Curved Surfaces; Gypsum Association; 2008.

1.04 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

C. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

1.05 QUALITY ASSURANCE
A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES
A. Provide completed assemblies complying with ASTM C840 and GA-216.
B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
C. Shaft Walls at HVAC Shafts: Provide completed assemblies with the following characteristics:
   1. Air Pressure Within Shaft: Sustained loads of 5 lbf/sq ft (0.24 kPa) with maximum mid-span deflection of L/240.
   2. Acoustic Attenuation: STC of 35-39 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
D. Shaft Walls at Elevator Shafts: Provide completed assemblies with the following characteristics:
   1. Air Pressure Within Shaft: Intermittent loads of 5 lbf/sq ft (0.24 kPa) with maximum mid-span deflection of L/240.
   2. Acoustic Attenuation: STC of 35-39 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
E. Fire Rated Assemblies: Provide completed assemblies with the following characteristics:
   1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 METAL FRAMING MATERIALS
A. Resilient channels: Dietrich deluxe resilient channel (RCSD); 22 miil steel with 1 1/2” nailing flange.

2.03 BOARD MATERIALS
A. Manufacturers - Gypsum-Based Board:
   8. USG Corporation: www.usg.com/#sle.
B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Glass mat faced gypsum panels as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
      a. Use Glass-mat faced gypsum panels above shower surrounds from top of surround to ceiling.
      b. Use Glass-mat faced gypsum panels anywhere panels may be exposed to becoming wet from inclement weather during construction.
3. Unfaced fiber-reinforced gypsum panels as defined in ASTM C1278/C1278M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.

4. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   a. Mold-resistant board is required whenever board is being installed before the building is enclosed and conditioned.

5. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.

6. Glass-Mat-Faced Products (non paper faced):
   a. Georgia-Pacific Gypsum; DensArmor Plus.
   b. Georgia-Pacific Gypsum; DensArmor Plus Fireguard C.
   c. National Gypsum Company; Gold Bond eXP Interior Extreme Gypsum Panel.
   d. Temple-Inland Building Product by Georgia-Pacific, LLC; GreenGlass Interior Gypsum Board.
   e. National Gypsum Company; Gold Bond eXP Fire-Shield Interior Extreme Gypsum Panel.
   f. USG Corporation; USG Sheetrock Brand Glass-Mat Panels Mold Tough.

C. Backing Board For Wet Areas: One of the following products:
   1. Application: Surfaces behind tile in wet areas including bathrooms without showers.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
      a. Thickness: 1/2 inch (12.7 mm).
      b. Products:
         2) National Gypsum Company; PermaBase Brand Cement Board.
         3) National Gypsum Company; PermaBase Flex Brand Cement Board.
         4) USG Corporation: www.usg.com/#sle.

D. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
   1. Application: Vertical surfaces behind thinset tile, except in wet areas.
   2. Edges: Tapered.
   3. Products:
      a. American Gypsum Company; M-Bloc.
      b. American Gypsum Company; M-Bloc Type X.
      c. Georgia-Pacific Gypsum; ToughRock Mold-Guard Gypsum Board.
      d. Georgia-Pacific Gypsum; DensArmor Plus.
      e. National Gypsum Company; Gold Bond XP Gypsum Board.

E. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Ceilings, unless otherwise indicated.
   2. Thickness: as indicated on drawings.

F. Exterior Sheathing Board and board at shower enclosure walls and ceilings for a distance of 4' from back wall: Sizes to minimize joints in place; ends square cut.
   1. Application: Exterior sheathing, unless otherwise indicated.
   2. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
   3. Core Type: Type X, as indicated.
   4. Type X Thickness: 5/8 inch (16 mm).
   5. Edges: Square.
   6. Glass Mat Faced Products:
2.04 ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3 5/8" inch (____ mm).

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. Water-Resistive Barrier: As specified in Section 07 2500.

D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
   1. Fiberglass Tape: 2 inch (50 mm) wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
   2. Paper Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners, except as otherwise indicated.
   3. Joint Compound: Setting type, field-mixed.

E. High Build Drywall Surfacer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.

F. Textured Finish Materials: Latex-based compound; plain.
   1. Primer: Of type recommended by texture finish manufacturer.
   2. USG Sheetrock Brand Ceiling Spray Texture-QT Poly, medium polystyrene aggregate.

G. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.03 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
   1. Exception: Tapered edges to receive joint treatment at right angles to framing.

C. Double-Layer Non-Rated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

D. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

E. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
   1. Paper-Faced Sheathing: Immediately after installation, protect from weather by application of water-resistive barrier.
F. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

G. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of non-rated double-layer assemblies, which may be installed by means of adhesive lamination.

H. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For non-rated assemblies, install as follows:

I. Curved Surfaces: Apply gypsum board to curved substrates in accordance with GA-226.

3.04 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

B. Corner Beads: Install at external corners, using longest practical lengths.

3.05 JOINT TREATMENT

A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.

B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).

D. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-216.
   1. Level 1 for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistive-rated assemblies and sound-rated assemblies.
   2. Level 2 where water-resistant gypsum backing board panels form substrates for tile, and where indicated.
   3. Level 3 for gypsum board surfaces to receive medium texture.
   4. Level 4 for gypsum board surfaces to be painted flat or to receive wallcoverings.
   5. Level 5 for gypsum board surfaces to be painted gloss or semi-gloss.

E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

F. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.06 PENETRATIONS

A. Fill openings created by penetrating items in unrated assemblies and draftstopping. Where exposed, finish to match level of remaining wall.

3.07 TEXTURE FINISH

A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.

3.08 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.
B. Tile for wall applications.
C. Cementitious backer board as tile substrate.
D. Coated glass mat backer board as tile substrate.
E. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 07 9005 - Joint Sealers.

1.03 REFERENCE STANDARDS

E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 2009 (Revised).

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
D. Samples: minimum one sample per tile specified illustrating pattern and color variations.
E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project. 1. See Section 01 6000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE
A. Maintain one copy of and ANSI A108/A118/A136 and TCNA (HB) on site.
B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.
C. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of documented experience.

1.06 MOCK-UP
A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.
B. Construct tile mock-up where indicated on drawings, incorporating all components specified for the location.
   1. Minimum size of mock-up is indicated on drawings.
   2. Approved mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS
A. Do not install solvent-based products in an unventilated environment.
B. Maintain ambient and substrate temperature of 50 degrees F (10 degrees C) during installation of mortar materials.

PART 2 PRODUCTS
2.01 TILE
A. Manufacturers: All products by the same manufacturer.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Ceramic Mosaic Tile:
1. Size: 2 by 2 inch (51 by 51 mm), nominal.
2. Shape: Square.
3. Color(s): As indicated on drawings.
4. Products:

2.02 TRIM AND ACCESSORIES
A. Non-Ceramic Trim: Satin brass anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
   1. Applications:
      a. Open edges of wall tile.
      b. Open edges of floor tile.
      c. Wall corners, outside and inside.
      d. Transition between floor finishes of different heights.
      e. Thresholds at door openings.
      f. Floor to wall joints.
      g. Borders and other trim as indicated on drawings.
   2. Manufacturers:
      c. Substitutions: See Section 01 6000 - Product Requirements.

2.03 SETTING MATERIALS
A. Manufacturers:

   1. Applications: Use this type of bond coat where indicated and where no other type of bond coat is indicated.
   2. Products:
      a. ARDEX Engineered Cements; S 28: www.ardexamericas.com/#sle.
      b. Custom Building Products; Complete Contact-LFT Premium Rapid Setting Large Format Tile Mortar, with Multi-Surface Bonding Primer: www.custombuildingproducts.com/#sle.

2.04 GROUTS
A. Manufacturers:
   1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
2. Use sanded grout for joints 1/8 inch (3.2 mm) wide and larger; use unsanded grout for joints less than 1/8 inch (3.2 mm) wide.
3. Color(s): As indicated on drawings.
4. Products:
   b. Merkrete, by Parex USA, Inc; Merkrete Pro Grout: www.merkrete.com/#sle.
   d. Substitutions: See Section 01 6000 - Product Requirements.

C. Stain Resistant Grout Additive: Liquid admixture for sanded and unsanded cement-based grouts; mix with dry grout material in place of water.
1. Applications: throughout.
2. Products:
   b. Substitutions: See Section 01 6000 - Product Requirements.

2.05 MAINTENANCE MATERIALS
A. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.
1. Applications: Between tile and plumbing fixtures.
2. Color(s): As selected by Architect & Building Systems Engineer from manufacturer's full line.
3. Products:
   a. ARDEX Engineered Cements; ARDEX SX: www.ardexamericas.com/#sle.
   b. Custom Building Products; Commercial 100% Silicone Caulk:
      www.custombuildingproducts.com/#sle.
   d. Merkrete, by Parex USA, Inc; Merkrete Colored Caulking: www.merkrete.com/#sle.

B. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
1. Composition: Water-based colorless silicone.

2.06 ACCESSORY MATERIALS
A. Underlayment at Floors: Specifically designed for bonding to thin-set setting mortar; not primarily a waterproofing material and having the following characteristics:
B. Cementitious Backer Board: ANSI A118.9; High density, cementitious, glass fiber reinforced, 1/2 inch (13 mm) thick; 2 inch (50 mm) wide coated glass fiber tape for joints and corners. See Section 092116.
C. Coated Glass Mat Backer Board: ASTM C1178/C1178M, with coated inorganic fiberglass mat on both surfaces and integral acrylic coating vapor retarder. See Section 092116.
D. Mesh Tape: 2 inch (50 mm) wide self-adhesive fiberglass mesh tape.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.
D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

3.02 PREPARATION
A. Protect surrounding work from damage.
B. Vacuum clean surfaces and damp clean.
C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.
E. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL
A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.
B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
E. Form internal angles square and external angles bullnosed.
F. Install non-ceramic trim in accordance with manufacturer's instructions.
G. Sound tile after setting. Replace hollow sounding units.
H. Keep control and expansion joints free of mortar, grout, and adhesive.
I. Keep expansion joints free of adhesive or grout. Apply sealant to joints.
J. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
K. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.
L. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.
M. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS
A. Over exterior concrete substrates, install in accordance with TCNA (HB) Method F102, with standard grout.
B. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.
   1. Use uncoupling membrane under all tile unless other underlayment is indicated.
   2. Where waterproofing membrane is indicated, install in accordance with TCNA (HB) Method F122, with latex-Portland cement grout.
C. Over wood substrates, install in accordance with TCNA (HB) Method F142, with standard grout, unless otherwise indicated.
D. Over wood substrate with backer board underlayment, install in accordance with TCNA (HB) Method F144, for cementitious backer boards, with standard grout.

3.05 INSTALLATION - SHOWERS AND BATHTUB WALLS

A. At tiled shower receptors install in accordance with TCNA (HB) Method B415, mortar bed floor, and W244, thin-set over cementitious backer unit walls.

B. At bathtub walls install in accordance with TCNA (HB) Method B412, over cementitious backer units with waterproofing membrane.

C. Grout with standard grout as specified above.

D. Seal joints between tile work and other work with silicone type sealant specified in Section 07 9005.

3.06 INSTALLATION - WALL TILE

A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244, using membrane at toilet rooms.

B. Over coated glass mat backer board on studs, install in accordance with TCNA (HB) Method W245.

C. Over gypsum wallboard on wood or metal studs install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat, unless otherwise indicated.

D. Over wood studs without backer install in accordance with TCNA (HB) Method W231, mortar bed, with membrane where indicated.

3.07 CLEANING

A. Clean tile and grout surfaces.

3.08 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION
SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Acoustical units.

1.02 REFERENCE STANDARDS

D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate grid layout and related dimensioning.
C. Product Data: Provide data on suspension system components.
D. Samples: Submit two samples ____by____ inch (____by____ mm) in size illustrating material and finish of acoustical units.

1.04 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
B. Suspension Systems:
   1. Same as for acoustical units.

2.02 ACOUSTICAL UNITS

A. Manufacturers:
   1. Acoustical Tile: Basis-of-Design Product: Subject to compliance with requirements, provide Suprafine by Armstrong with Second Look II 24" x 48", white, or comparable product by one of the following
      e. Substitutions: See Section 01 6000 - Product Requirements.
B. Acoustical Units - General: ASTM E1264, type III Class A.
2. Comply with "Acoustical and Insulating Materials Association" (AIMA) "Performance Data Bulletin".
3. Provide panels that are sag resistant and manufactured for environment with humidity levels up to 100%.
4. Edge: Beveled regular.
5. Surface Color: White.
6. VOC Content: Certified as Low Emission by one of the following:

2.03 SUSPENSION SYSTEM(S)
A. Manufacturers:
   7. Substitutions: See Section 01 6000 - Product Requirements.
B. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.
C. Exposed Steel Suspension System: Formed steel, commercial quality cold rolled; intermediate-duty.
   1. Profile: Tee; 15/16 inch (24 mm) wide face.
D. At vinyl faced panels use exposed Aluminum Suspension System Type ____: Extruded aluminum; intermediate-duty.
   1. Profile: Tee; 15/16 inch (24 mm) wide face.
   2. Finish: Painted white.

2.04 ACCESSORIES
A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
B. Perimeter Moldings: Same material and finish as grid.
   1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.
C. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify existing conditions before starting work.
B. Verify that layout of hangers will not interfere with other work.
3.02 INSTALLATION - SUSPENSION SYSTEM
A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.
D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
H. Support fixture loads using supplementary hangers located within 6 inches (150 mm) of each corner, or support components independently.
I. Do not eccentrically load system or induce rotation of runners.
J. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Overlap and rivet corners.

3.03 INSTALLATION - ACOUSTICAL UNITS
A. Install acoustical units in accordance with manufacturer's instructions.
B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
C. Fit border trim neatly against abutting surfaces.
D. Install units after above-ceiling work is complete.
E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
F. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.

3.04 ATTIC STOCK
A. Provide one additional box of replacement acoustical ceiling tile to the owner for future use.

3.05 TOLERANCES
A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).
B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION
SECTION 09 6500
RESILIENT FLOORING

PART 1  GENERAL

1.01  SECTION INCLUDES
A. Static control resilient sheet flooring.
B. Resilient tile flooring.
C. Static control resilient tile flooring.
D. Resilient base.
E. Resilient stair accessories.

1.02  RELATED REQUIREMENTS
A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

1.03  REFERENCE STANDARDS
G. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; Resilient Floor Covering Institute; October 2011.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
C. Shop Drawings: Indicate seaming plans and floor patterns.
D. Selection Samples: Submit manufacturer's complete set of color samples for Architect & Building Systems Engineer's initial selection.
E. Verification Samples: Submit two samples, ____x____ inch ( _6_x_9_ mm) in size illustrating color and pattern for each resilient flooring product specified. For heat welding rod, submit manufacturer's standard size, but not less than 9 inches long, of each color specified.
F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.05  DELIVERY, STORAGE, AND HANDLING
A. Protect roll materials from damage by storing on end.

1.06  FIELD CONDITIONS
A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).
PART 2 PRODUCTS

2.01 TILE FLOORING
A. Vinyl Composition Tile: Homogeneous, with color extending throughout thickness.
    1. Manufacturers:
    2. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
    3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
    4. Size: 12 by 12 inch (305 by 305 mm).
    5. VOC Content Limits: As specified in Section 01 6116.
    6. Thickness: 0.125 inch (3.2 mm).
    7. Color: As indicated on drawings.

2.02 STAIR COVERING
A. Stair Tread / Riser Combination: Rubber tread with integrated riser for the visually impaired; full width and depth of stair tread in one piece; tapered thickness; nosing not less than 1-5/8 inch (41 mm) deep.
   1. Manufacturers:
   2. Minimum Requirements: Comply with FS RR-T-650 requirements corresponding to type specified.
   3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648 or NFPA 253.
   4. Nominal Thickness: 0.1875 inch (4.75 mm).
   6. Striping: 2 inch (24 mm) wide contrasting color abrasive strips.
   7. Color: As indicated on drawings.
   8. Manufacturers: Basis of design is Johnsonite, Inc; Product: standard raised round tread/riser visually impaired (virtr-rd): www.johnsonite.com. Other equivalent products are acceptable subject to approval from the Architect.

2.03 RESILIENT BASE
A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.
   1. Manufacturers:
   2. Height: 4 inch (100 mm).
   3. Thickness: 0.125 inch (3.2 mm).
   5. Length: Roll.
   6. Color: As indicated on drawings.
   7. Accessories: Premolded external corners and internal corners.

2.04 ACCESSORIES
A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
C. Moldings, Transition and Edge Strips: Same material as flooring.
D. Filler for Coved Base: Plastic.
E. Sealer and Wax: Types recommended by flooring manufacturer.

2.05 ATTIC STOCK
A. Provide the following “attic stock” additional product materials at the conclusion of construction for storage on site by the owner:
   1. All unused flooring materials to be left onsite - materials must be clearly labeled.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
   1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION
A. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI (RWP).
B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
C. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
D. Prohibit traffic until filler is fully cured.

3.03 INSTALLATION - GENERAL
A. Starting installation constitutes acceptance of sub-floor conditions.
B. Install in accordance with manufacturer's written instructions.

3.04 INSTALLATION - SOUND CONTROL UNDERLAYMENT
A. Install in accordance with underlayment manufacturer's instructions.

3.05 INSTALLATION - SHEET FLOORING
A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.
B. Seams are prohibited in bathrooms, kitchens, toilet rooms, and custodial closets.
C. Cut sheet at seams in accordance with manufacturer's instructions.
D. Seal seams by heat welding where indicated.

3.06 INSTALLATION - TILE FLOORING
A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.
B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

3.07 INSTALLATION - RESILIENT BASE
A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.
B. Miter internal corners. At external corners, use premolded units. At exposed ends, use premolded units.
C. Install base on solid backing. Bond tightly to wall and floor surfaces.
D. Scribe and fit to door frames and other interruptions.

3.08 INSTALLATION - STAIR COVERINGS
A. Install stair coverings in one piece for full width and depth of tread.
B. Adhere over entire surface. Fit accurately and securely.

3.09 CLEANING
A. Remove excess adhesive from floor, base, and wall surfaces without damage.
B. Clean in accordance with manufacturer's written instructions.

3.10 PROTECTION
A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION
SECTION 09 9000
PAINTING AND COATING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.
B. Field application of paints, stains, varnishes, and other coatings.
C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Walls, ceilings, base trim, casings, doors and frames.
   2. On roof where visible paint all pipes, ducts and chimneys that penetrate the roof to match roof color.
   3. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   4. Elevator pit ladders.
   5. Exposed surfaces of steel lintels and ledge angles.
   6. Prime surfaces to receive wall coverings.
   7. Mechanical and Electrical:
      a. In finished areas, paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.
D. Do Not Paint or Finish the Following Items:
   1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne, and lead items.
   6. Marble, granite, slate, and other natural stones.
   7. Floors, unless specifically so indicated.
   8. Ceramic and other tiles.
   9. Glass.
   10. Acoustical materials, unless specifically so indicated.
   11. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

B. SSPC (PM1) - Good Painting Practice: SSPC Painting Manual, Vol. 1; Society for Protective Coatings; Fourth Edition.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide complete list of all products to be used, with the following information for each:
1. Manufacturer’s name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
2. MPI product number (e.g. MPI #47).
3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Paint and Coatings: 1 gallon (4 L) of each color.
   3. Label each container with color in addition to the manufacturer's label.
   4. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-Williams "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.06 QUALITY ASSURANCE
   A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING
   A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
   B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
   C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS
   A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
   B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
   C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
   D. Minimum Application Temperatures for Latex Paints: 45 degrees F (7 degrees C) for interiors; 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.
   E. Minimum Application Temperature for Varnish Finishes: 65 degrees F (18 degrees C) for interior or exterior, unless required otherwise by manufacturer's instructions.
   F. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS
   A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.
   B. Provide all paint and coating products from the same manufacturer to the greatest extent possible.
   C. Paints:

D. Transparent Finishes:

E. Stains:

F. Primer Sealers: Same manufacturer as top coats.
G. Block Fillers: Same manufacturer as top coats.
H. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PAINTS AND COATINGS - GENERAL

A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
4. Supply each coating material in quantity required to complete entire project's work from a single production run.
5. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

B. Primers: As follows unless other primer is required or recommended by manufacturer of top coats; where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

C. Volatile Organic Compound (VOC) Content: Comply with Section 01 6116.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect & Building Systems Engineer from the manufacturer's full line.

E. Colors: As indicated on drawings
1. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
2. Extend colors to surface edges; colors may change at any edge as directed by Architect & Building Systems Engineer.
3. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.03 PAINT SYSTEMS - EXTERIOR

A. CONCRETE - (Cementitious Siding, Flexboard, Transite Board, Shingles (Non-Roof), Common Brick, Stucco, Tilt-up, Precast, and Poured-in-place Cement)
1. Latex Systems
   a. Gloss Finish
      1) 1st Coat: S-W Loxon Interior / Exterior Acrylic Masonry Primer, A24W8300 (8 mils wet, 3.2 dry)
      2) 2nd Coat: S-W A-100 Exterior Latex Gloss, A8W10051 Series
      3) 3rd Coat: S-W A-100 Exterior Latex Gloss, A8W10051 Series (4 mils wet, 1.3 mils dry per coat)
   b. Semi-Gloss Finish
      1) 1st Coat: S-W Loxon Interior / Exterior Acrylic Masonry Primer, A24W8300 (8 mils wet, 3.2 mils dry)
      2) 2nd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series
3) 3rd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series (4 mils wet, 1.5 mils dry per coat)

c. Satin Finish
1) 1st Coat: S-W Loxon Interior / Exterior Acrylic Masonry Primer, A24W8300 (8 mils wet, 3.2 dry)
2) 2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series
3) 3rd Coat: S-W A-100 Exterior Latex Satin, A82 Series (4 mils wet, 1.4 mils dry per coat)

d. Flat Finish
1) 1st Coat: S-W Loxon Interior / Exterior Acrylic Masonry Primer, A24W8300 (8 mils wet, 3.2 mils dry)
2) 2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series
3) 3rd Coat: S-W A-100 Exterior Latex Flat, A6 Series (4 mils wet, 1.4 mils dry per coat)

2. Elastomeric System (not including; cementitious siding, Flexboard, Transite board, shingles.
   a. Flat Finish
   1) 1st Coat: S-W Loxon Interior / Exterior Acrylic Masonry Primer, A24W8300 (8 mils wet, 3.2 mils dry)
   2) 2nd Coat: S-W ConFlex XL Elastomeric High Build Coating, A5-400 Series
   3) 3rd Coat: S-W ConFlex XL Elastomeric High Build Coating, A5-400 Series (16 mils wet, 7.5 mils dry per coat)
   b. Alternate
   1) 1st Coat: S-W Loxon BlockSurfacer, A24W200 (50-100 sq ft/gal)
   2) 2nd Coat: S-W SherLastic Elastomeric Coating, A5-100 Series
   3) 3rd Coat: S-W SherLastic Elastomeric Coating, A5-100 Series (14 mils wet, 6 mils dry per coat)

3. Textured Elastomeric System
   a. Textured Finish
   1) 1st Coat: S-W Loxon BlockSurfacer, A24W200 (50-100 sq ft/gal)
   2) 2nd Coat: S-W ConFlex XL Elastomeric High Build Coating, A5-400 Series (16 mils wet, 7.5 mils dry per coat)
   3) 3rd Coat: S-W ConFlex XL Textured Elastomeric High Build Coating, A5-800 (Fine, Medium, Extra Coarse) (20 mils wet, 9.4 mils dry per coat)

4. Textured & Smooth Systems
   a. Textured (Water Based Finish)
   1) 1st Coat: S-W Loxon XP Smooth, A24W400 Series (14-18 mils wet; 6.4-8.3 mils dry)
   2) 2nd Coat: S-W Loxon XP Fine Textured Waterproofing System, A24-750 Series (14-18 mils wet)
   b. Alternate
   1) 1st Coat: S-W Loxon BlockSurfacer, A24W200 (50-100 sq ft/gal)
   2) 2nd Coat: S-W UltraCrete Textured Masonry Topcoat A44-800 Series (Fine, Medium, Extra Coarse) (50-80 sq ft/gal)
   c. Textured Finish (Solvent Based)
   1) 1st Coat: S-W UltraCrete Smooth Masonry Water Proof Topcoat, B46 Series (100-160 sq ft/gal)
   2) 2nd Coat: S-W UltraCrete Textured Masonry Water Proof Topcoat, B46 Series (Fine, Medium, Extra Coarse) (50-80 sq ft/gal)
   d. Smooth (Water Based Finish)
   1) 1st Coat: S-W Loxon XP, A24W400 Series
   2) 2nd Coat: S-W Loxon XP, A24W400 Series (14-18 mils wet; 6.4-8.3 mils dry) optional

5. Stain System
a. Solid Color Waterborne Finish
   1) 1st Coat: S-W Vertical Concrete Stain, A31 Series
   2) 2nd Coat: S-W Vertical Concrete Stain, A31 Series (50-250 sq/ft gal)

6. Clear Water Repellant
   a. Clear
      1) 1st Coat: S-W Loxon7% Siloxane Water Repellant, A10T7
      2) 2nd Coat: S-W Loxon7% Siloxane Water Repellant, A10T7 (50-200 sq ft/ gal)

B. MASONRY (Concrete Masonry Units [CMU]- Cinder or Concrete Block)
   1. Latex Systems
      a. Gloss Finish
         1) 1st Coat: S-W PrepRite Block Filler, B25W25 (16 mils wet, 8 mils dry)
         2) 2nd Coat: S-W A-100 Exterior Latex Gloss, A8W10051 Series
         3) 3rd Coat: S-W A-100 Exterior Latex Gloss, A8W10051 Series (4 mils wet, 1.3 mils dry per coat)
      b. Semi-Gloss Finish
         1) 1st Coat: S-W PrepRite Block Filler, B25W25 (16 mils wet, 8 mils dry)
         2) 2nd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series
         3) 3rd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series (4 mils wet, 1.5 mils dry per coat)
      c. Satin Finish
         1) 1st Coat: S-W PrepRite Block Filler, B25W25 (16 mils wet, 8 mils dry)
         2) 2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series
         3) 3rd Coat: S-W A-100 Exterior Latex Satin, A82 Series (4 mils wet, 1.4 mils dry per coat)
      d. Flat Finish
         1) 1st Coat: S-W PrepRite Block Filler, B25W25 (16 mils wet, 8 mils dry)
         2) 2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series
         3) 3rd Coat: S-W A-100 Exterior Latex Flat, A6 Series (4 mils wet, 1.4 mils dry per coat)
   2. Elastomeric System
      a. Flat Finish
         1) 1st Coat: S-W Loxon BlockSurfacer, A24W200 (50-100 sq ft/gal)
         2) 2nd Coat: S-W ConFlex XL Elastomeric High Build Coating, A5-400 Series
         3) 3rd Coat: S-W ConFlex XL Elastomeric High Build Coating, A5-400 Series (16 mils wet, 7.5 mils dry per coat)
      b. Alternate
         1) 1st Coat: S-W Loxon BlockSurfacer, A24W200 (50-100 sq ft/gal)
         2) 2nd Coat: S-W Sherlastic Elastomeric Coating, A5-100 Series
         3) 3rd Coat: S-W Sherlastic Elastomeric Coating, A5-100 Series (14 mils wet, 6 mils dry per coat)
   3. Textured Elastomeric System
      a. Textured Finish
         1) 1st Coat: S-W Loxon BlockSurfacer, A24W200 (50-100 sq ft/gal)
         2) 2nd Coat: S-W ConFlex XL Elastomeric High Build Coating, A5-400 Series (16 mils wet, 7.5 mils dry per coat)
         3) 3rd Coat: S-W ConFlex XL Textured Elastomeric High Build Coating, A5-800 (Fine, Medium, Extra Coarse) (20 mils wet, 9.4 mils dry per coat)
   4. Textured Masonry System
      a. Textured (Water Based Finish)
         1) 1st Coat: S-W Loxon XP Smooth, A24W400 Series (14-18 mils wet; 6.4-8.3 mils dry)
         2) 2nd Coat: S-W Loxon XP Fine Textured Waterproofing System, A24-750 Series (14-18 mils wet)
b. Alternate
   1) 1st Coat: S-W Loxon BlockSurfacer, A24W200 (50-100 sq ft/gal)
   2) 2nd Coat: S-W UltraCrete Textured Masonry Topcoat A44-800 Series (Fine, Medium, Extra Coarse) (50-80 sq ft/gal)

   c. Textured Finish (Solvent Based)
      1) 1st Coat: S-W UltraCrete Smooth Masonry Water Proof Topcoat, B46 Series (100-160 sq ft/gal)
      2) 2nd Coat: S-W UltraCrete Textured Masonry Water Proof Topcoat, B46 Series (Fine, Medium, Extra Coarse) (50-80 sq ft/gal)

   d. Smooth (Water Based Finish)
      1) 1st Coat: S-W Loxon XP, A24W400 Series
      2) 2nd Coat: S-W Loxon XP, A24W400 Series (14-18 mils wet; 6.4-8.3 mils dry) optional

5. Stain System
   a. Solid Color Waterborne Finish
      1) 1st Coat: S-W Vertical Concrete Stain, A31 Series
      2) 2nd Coat: S-W Vertical Concrete Stain, A31 Series (50-250 sq/ft gal)

6. Clear Water Repellant
   a. Clear
      1) 1st Coat: S-W Loxon7% Siloxane Water Repellant, A10T7
      2) 2nd Coat: S-W Loxon7% Siloxane Water Repellant, A10T7 (50-200 sq ft/ gal)

C. CONCRETE- (Concrete Floors, Patios, Porches, Steps & Platforms)
   1. Acrylic System Water-Based
      a. Floor Finish
         1) 1st Coat: S-W Porch & Floor Enamel, A32-100 Series
         2) 2nd Coat: S-W Porch & Floor Enamel, A32-100 Series (4mils wet; 1.4 mils dry per coat)
         3) 1st Coat: S-W Sher-Crete Flexible Concrete Waterproofer, A5 Series
         4) 2nd Coat: S-W Sher-Crete Flexible Concrete Waterproofer, A5 Series (14-18 mils wet per coat)

D. METAL - (Aluminum, Galvanized)
   1. Latex Systems
      a. Gloss Finish
         1) 1st Coat: S-W A-100 Exterior Latex Gloss, A8W10051 Series
         2) 2nd Coat: S-W A-100 Exterior Latex Gloss, A8W10051 Series (4 mils wet, 1.3 mils dry per coat)

      b. Semi-Gloss Finish
         1) 1st Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series
         2) 2nd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series (4 mils wet, 1.5 mils dry per coat)

      c. Satin Finish
         1) 1st Coat: S-W A-100 Exterior Latex Satin, A82 Series
         2) 2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series (4 mils wet, 1.4 mils dry per coat)

      d. Flat Finish
         1) 1st Coat: S-W A-100 Exterior Latex Flat, A6 Series
         2) 2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series (4 mils wet, 1.4 mils dry per coat)

E. METAL - (Misc. Iron, Ornamental Iron, Structural Iron & Steel, Ferrous Metal)
   1. Latex Systems
      a. Gloss Finish
         1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series (5-10 mils wet, 2-4 mils dry)
         2) 2nd Coat: S-W A-100 Exterior Latex Gloss, A8W10051 Series
3) 3rd Coat: S-W A-100 Exterior Latex Gloss, A8W10051 Series (4 mils wet, 1.3 mils dry per coat)

b. Semi-Gloss Finish
1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series (5-10 mils wet, 2-4 mils dry)
2) 2nd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series
3) 3rd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series (4 mils wet, 1.5 mils dry per coat)

F. WOOD- Decks, Exterior Trim (including pressure treated lumber) (Floors, Platforms)
1. Acrylic Water-Based Floor System
   a. Floor Finish
      1) 1st Coat: S-W Porch & Floor Enamel, A32-100 Series
      2) 2nd Coat: S-W Porch & Floor Enamel, A32-100 Series (4mils wet; 1.4 mils dry per coat)

   2. Stain Systems
      a. Solid Color Acrylic Latex
         1) 1st Coat: S-W DeckScapes Ext. Acrylic Solid Color Deck Stain, A15-150 Series
         2) 2nd Coat: S-W DeckScapes Ext. Acrylic Solid Color Deck Stain, A15-150 Series (200-400 s/f per gal.)
     
      b. Semi-Transparent Stain
         1) 1st Coat: S-W DeckScapes Ext. Waterborne Deck Stain, A15T15 Series
         2) 2nd Coat: S-W DeckScapes Ext. Waterborne Deck Stain, A15T15 Series (100-300 s/f per gal)
     
      c. Clear Stain
         1) 1st Coat: S-W DeckScapes Ext. Waterborne Clear, A15T260
         2) 2nd Coat: S-W DeckScapes Ext. Waterborne Clear, A15T260 (150-300 sq/ft gal)

2. Stain - Water Reducible Systems
   a. Semi-Transparent
      1) 1st Coat: S-W WoodScapes Polyurethane Stain, A15T5
2) 2nd Coat: S-W WoodScapes Polyurethane Stain, A15T5 (100-350 sq ft/gal)

b. Solid Color
   1) 1st Coat: S-W WoodScapes Solid Color Stain, A15 Series
   2) 2nd Coat: S-W WoodScapes Solid Color Stain, A15 Series (200-400 sq ft/gal)

H. ARCHITECTURAL PVC, PLASTIC, FIBERGLASS (due to the variety of substrate, check for compatibility)
   1. Latex Systems
      a. Gloss Finish
         1) 1st Coat: S-W PrepRite ProBlock Latex Primer, B51 Series (4 mils wet, 1.4 mils dry)
         2) 2nd Coat: S-W A-100 Exterior Latex Gloss, A8W10051 Series
         3) 3rd Coat: S-W A-100 Exterior Latex Gloss, A8W10051 Series (4 mils wet, 1.3 mils dry per coat)
      b. Semi-Gloss
         1) 1st Coat: S-W Multi-Purpose Latex Primer, B51-450 Series (4 mils wet, 1.4 mils dry)
         2) 2nd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series
         3) 3rd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series (4 mils wet, 1.5 mils dry per coat)
      c. Satin Finish
         1) 1st Coat: S-W Multi-Purpose Latex Primer, B51-450 Series (4 mils wet, 1.4 mils dry)
         2) 2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series
         3) 3rd Coat: S-W A-100 Exterior Latex Satin, A82 Series (4 mils wet, 1.4 mils dry per coat)
      d. Flat Finish
         1) 1st Coat: S-W Multi-Purpose Latex Primer, B51-450 Series (4 mils wet, 1.4 mils dry)
         2) 2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series
         3) 3rd Coat: S-W A-100 Exterior Latex Flat, A6 Series (4 mils wet, 1.4 mils dry per coat)

I. DRYWALL (Gypsum Board, Exterior Drywall)
   1. Latex Systems
      a. Gloss Finish
         1) 1st Coat: S-W Exterior Latex Wood Primer B42W81 (4 mils wet, 1.4 mils dry)
         2) 2nd Coat: S-W A-100 Exterior Latex Gloss, A8W10051 Series
         3) 3rd Coat: S-W A-100 Exterior Latex Gloss, A8W10051 Series (4 mils wet, 1.3 mils dry per coat)
      b. Semi-Gloss Finish
         1) 1st Coat: S-W Exterior Latex Wood Primer B42W81 (4 mils wet, 1.4 mils dry)
         2) 2nd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series
         3) 3rd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series (4 mils wet, 1.5 mils dry per coat)
      c. Satin Finish
         1) 1st Coat: S-W Exterior Latex Wood Primer B42W81 (4 mils wet, 1.4 mils dry)
         2) 2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series
         3) 3rd Coat: S-W A-100 Exterior Latex Satin, A82 Series (4 mils wet, 1.4 mils dry per coat)
      d. Flat Finish
         1) 1st Coat: S-W Exterior Latex Wood Primer B42W81 (4 mils wet, 1.4 mils dry)
         2) 2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series
         3) 3rd Coat: S-W A-100 Exterior Latex Flat, A6 Series (4 mils wet, 1.4 mils dry per coat)

J. VINYL SIDING* EIFS, SYNTHETIC STUCCO
1. Latex Systems  
   a. Gloss Finish  
      1) 1st Coat: S-W A-100 Exterior Latex Gloss, A8W10051 Series  
      2) 2nd Coat: S-W A-100 Exterior Latex Gloss, A8W10051 Series (4 mils wet, 1.3 mils dry per coat)  
   b. Semi-Gloss Finish  
      1) 1st Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series  
      2) 2nd Coat: S-W Metalatex Acrylic Semi-Gloss, B42 Series (4 mils wet, 1.5 mils dry per coat)  
   c. Satin Finish  
      1) 1st Coat: S-W A-100 Exterior Latex Satin, A82 Series  
      2) 2nd Coat: S-W A-100 Exterior Latex Satin, A82 Series (4 mils wet, 1.4 mils dry per coat)  
   d. Flat Finish  
      1) 1st Coat: S-W A-100 Exterior Latex Flat, A6 Series  
      2) 2nd Coat: S-W A-100 Exterior Latex Flat, A6 Series (4 mils wet, 1.4 mils dry per coat)  

2.04 PAINT SYSTEMS - INTERIOR  

A. CONCRETE - (Walls & Ceilings, Poured Concrete, Precast Concrete, Unglazed Brick, Cement Board, Tilt-Up, Cast-In-Place)  

B. Latex Systems  
   1. Gloss  
      a. 1st Coat: S-W Loxon Concrete & Masonry Primer A24W8300 (7 mils wet, 3 mils dry)  
      b. 2nd Coat: S-W ProMar® 400 Latex Gloss B21W400 Series  
      c. 3rd Coat: S-W ProMar® 400 Latex Gloss B21W400 Series (4 mils wet, 1.5 mils dry per coat)  
   d. Semi-Gloss Finish  
      a. 1st Coat: S-W Loxon Concrete & Masonry Primer A24W8300 (7 mils wet, 3 mils dry)  
      b. 2nd Coat: S-W ProMar 400 Zero VOC Latex Semi-Gloss B31W4600  
      c. 3rd Coat: S-W ProMar 400 Zero VOC Latex Semi-Gloss B31W4600 (4 mils wet, 1.3 mils dry per coat)  
   e. Eg-Shel / Satin Finish  
      a. 1st Coat: S-W Loxon Concrete & Masonry Primer A24W8300 (7 mils wet, 3 mils dry)  
      b. 2nd Coat: S-W ProMar 400 Zero VOC Latex Eg-Shel B20W4600  
      c. 3rd Coat: S-W ProMar 400 Zero VOC Latex Eg-Shel B20W4600 (4 mils wet, 1.3 mils dry per coat)  
   f. Flat Finish  
      a. 1st Coat: S-W Loxon Concrete & Masonry Primer A24W8300 (7 mils wet, 3 mils dry)  
      b. 2nd Coat: S-W ProMar 400 Zero VOC Latex Flat B30W4600  
      c. 3rd Coat: S-W ProMar 400 Zero VOC Latex Flat B30W4600 (4 mils wet, 1.4 mils dry per coat)  

C. Concrete Stain (Water Base)  
   1. Flat Finish Opaque  
      a. 1st Coat: S-W H&C Concrete Stain Solid Color Water Based  
      b. 2nd Coat: S-W H&C Concrete Stain Solid Color Water Based (50-300 sq/ft per gallon)  

D. CONCRETE- FLOORS  
   1. Acrylic System  
      a. Gloss Finish  
      1) 1st Coat: S-W Porch & Floor Enamel, A32-100 series  
      2) 2nd Coat: S-W Porch & Floor Enamel, A32-100 series (4 mils wet, 1.4 mils dry)  
      3) Alternate  
      4) 1st Coat: S-W Sher-Crete Flexible Concrete Waterproofer, A5 Series
5) 2nd Coat: S-W Sher-Crete Flexible Concrete Waterproofer, A5 Series (14-18 mils wet per coat)

2. Concrete Stain (Water Base)
   a. Low Luster Finish Opaque
      1) 1st Coat: S-W H&C Concrete Stain Solid Color Water Based
      2) 2nd Coat: S-W H&C Concrete Stain Solid Color Water Based (50-300 sq/ft per gallon)

E. MASONRY - (CMU - Concrete, Split, Scored, Smooth, Fluted)
   1. Latex Systems
      a. Gloss Finish
         1) 1st Coat: S-W PrepRite® Block Filler, B25W25 (75-125 sq ft/gal)
         2) 2nd Coat: S-W ProMar® 400 Latex Gloss, B21W400 Series
         3) 3rd Coat: S-W ProMar® 400 Latex Gloss, B21W400 Series (4 mils wet, 1.5 mils dry per coat)
      b. Semi-Gloss Finish
         1) 1st Coat: S-W PrepRite® Block Filler, B25W25 (75-125 sq ft/gal)
         2) 2nd Coat: S-W ProMar 400 Zero VOC Latex Semi-Gloss B31W4600
         3) 3rd Coat: S-W ProMar 400 Zero VOC Latex Semi-Gloss B31W4600 (4 mils wet, 1.3 mils dry per coat)
      c. Eggshell/Satin Finish
         1) 1st Coat: S-W PrepRite® Block Filler, B25W25 (75-125 sq ft/gal)
         2) 2nd Coat: S-W ProMar 400 Zero VOC Latex Eggshell B20W4600
         3rd Coat: S-W ProMar 400 Zero VOC Latex Eggshell B20W4600 (4 mils wet, 1.6 mils dry per coat)
      d. Flat Finish
         1) 1st Coat: S-W PrepRite® Block Filler, B25W25 (75-125 sq ft/gal)
         2) 2nd Coat: S-W ProMar 400 Zero VOC Latex Flat B30W4600
         3) 3rd Coat: S-W ProMar 400 Zero VOC Latex Flat B30W4600 (4 mils wet, 1.4 mils dry per coat)
   2. Concrete Stain (Water Base)
      a. Flat Finish Opaque
         1) 1st Coat: S-W H&C Concrete Stain Solid Color Water Based
         2) 2nd Coat: S-W H&C Concrete Stain Solid Color Water Based (50-300 sq/ft per gallon)

F. METAL - (Aluminum, Galvanized)
   1. Latex Systems
      a. Gloss Finish
         1) 1st Coat: S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series (2-4 mils dry)
         2) 2nd Coat: S-W ProMar® 400 Latex Gloss Enamel, B21W400 Series
         3) 3rd Coat: S-W ProMar® 400 Latex Gloss Enamel, B21W400 Series (4 mils wet, 1.5 mils dry per coat)
      b. Semi-Gloss Finish
         1) 1st Coat: S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series (2-4 mils dry)
         2) 2nd Coat: S-W ProMar 400 Zero VOC Latex Semi-Gloss B31W4600
         3) 3rd Coat: S-W ProMar 400 Zero VOC Latex Semi-Gloss B31W4600 (4 mils wet, 1.3 mils dry per coat)
      c. Block Resistant Finish
         1) 1st Coat: S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series (2-4 mils dry)
         2) 2nd Coat: S-W ProClassic® Waterborne Acrylic Semi-Gloss Enamel, B31 Series
         3) 3rd Coat: S-W ProClassic® Waterborne Acrylic Semi-Gloss Enamel, B31 Series (4 mils wet, 1.3 mils dry per coat)
      d. Eggshell/Satin Finish
         1) 1st Coat: S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series (2-4 mils dry)
         2) 2nd Coat: S-W ProMar 400 Zero VOC Latex Eggshell B20W4600
3) 3rd Coat: S-W ProMar 400 Zero VOC Latex Eg-Shel B20W4600 (4 mils wet, 1.5 mils dry per coat)

e. Flat Finish
1) 1st Coat: S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series (2-4 mils dry)
2) 2nd Coat: S-W ProMar 400 Zero VOC Latex Flat B30W4600
3) 3rd Coat: S-W ProMar 400 Zero VOC Latex Flat B30W4600 (4 mils wet, 1.4 mils dry per coat)

2. Alkyd / Acrylic Systems

a. Gloss Finish (Water base)
1) 1st Coat: S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series (2.0 - 4.0 mils dry per coat)
2) 2nd Coat: S-W Waterbased Industrial Enamel, B53-300 Series
3) 3rd Coat: S-W Waterbased Industrial Enamel, B53-300 Series (4 mils wet, 1.6 mils dry per coat)

b. Semi-Gloss Acrylic / Alkyd Finish
1) 1st Coat: S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series (2-4 mils dry)
2) 2nd Coat: S-W ProMar 200 Interior Waterbased Acrylic-Alkyd Semi-Gloss B34-8200
3) 3rd Coat: S-W ProMar 200 Interior Waterbased Acrylic-Alkyd Semi-Gloss B34-8200 (4 mils wet, 1.7 mils dry per coat)

b. Semi-Gloss Finish
1) 1st Coat: S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series (2-4 mils dry)

c. Block Resistant Finish
1) 1st Coat: S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series (2-4 mils dry)
2) 2nd Coat: S-W ProClassic® Waterborne Acrylic Semi-Gloss Enamel, B31 Series
3) 3rd Coat: S-W ProClassic® Waterborne Acrylic Semi-Gloss Enamel, B31 Series (4 mils wet, 1.3 mils dry per coat)

d. Eg-Shel / Satin Finish
1) 1st Coat: S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series (2-4 mils dry)
2) 2nd Coat: S-W ProMar 400 Zero VOC Latex Eg-Shel B20W4600
3) 3rd Coat: S-W ProMar 400 Zero VOC Latex Eg-Shel B20W4600 (4 mils wet, 1.5 mils dry per coat)

e. Flat Finish
1) 1st Coat: S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series (2-4 mils dry)
2) 2nd Coat: S-W ProMar 400 Zero VOC Latex Flat B30W4600
3) 3rd Coat: S-W ProMar 400 Zero VOC Latex Flat B30W4600 (4 mils wet, 1.4 mils dry)

2. Alkyd Systems

a. Gloss Finish (Solvent Base)
1) 1st Coat: S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series (2-4 mils dry)
2) 2nd Coat: S-W Industrial Enamel HS, B54Z400 Series
3) 3rd Coat: S-W Industrial Enamel HS, B54Z400 Series (2.0 - 4.0 mils dry per coat)
b. Gloss Finish (Water Base)
   1) 1st Coat: S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series (2-4 mils dry)
   2) 2nd Coat: S-W Waterbased Industrial Enamel, B53-300 Series
   3) 3rd Coat: S-W Waterbased Industrial Enamel, B53-300 Series (4 mils wet, 1.6 mils dry per coat)

c. Semi-Gloss (Solvent base)
   1) 1st Coat: S-W Pro Industrial Pro-Cryl® Primer, B66-310 Series (2-4 mils dry)
   2) 2nd Coat: S-W ProMar 200 Interior Waterbased Acrylic-Alkyd Semi-Gloss B34-8200
   3) 3rd Coat: S-W ProMar 200 Interior Waterbased Acrylic-Alkyd Semi-Gloss B34-8200 (4 mils wet, 1.7 mils dry per coat)

H. WOOD- (Walls, Ceilings, Doors, Trim,)
1. Latex Systems
   a. Gloss Finish
      1) 1st Coat: S-W PrepRite® ProBlock Latex. B51 Series (4 mils wet, 1.4 mils dry)
      2) 2nd Coat: S-W ProMar® 400 Latex Gloss, B21W400 Series
      3) 3rd Coat: S-W ProMar® 400 Latex Gloss, B21W400 Series (4 mils wet, 1.5 mils dry per coat)
   b. Semi-Gloss Finish
      1) 1st Coat: S-W SW Multi-Purpose Interior / Exterior Latex Primer B51-450 Series (4 mils wet, 1.4 mils dry)
      2) 2nd Coat: S-W ProMar 400 Zero VOC Latex Semi-Gloss B31W4600
      3) 3rd Coat: S-W ProMar 400 Zero VOC Latex Semi-Gloss B31W4600 (4 mils wet, 1.3 mils dry per coat)
   c. Eg-Shel / Satin Finish
      1) 1st Coat: S-W SW Multi-Purpose Interior / Exterior Latex Primer B51-450 Series (4 mils wet, 1.4 mils dry)
      2) 2nd Coat: S-W ProMar 400 Zero VOC Latex Eg-Shel B20W4600
      3) 3rd Coat: S-W ProMar 400 Zero VOC Latex Eg-Shel B20W4600 (4 mils wet, 1.5 mils dry per coat)
   d. Flat Finish
      1) 1st Coat: S-W SW Multi-Purpose Interior / Exterior Latex Primer B51-450 Series (4 mils wet, 1.4 mils dry)
      2) 2nd Coat: S-W ProMar 400 Zero VOC Latex Flat B30W4600
      3) 3rd Coat: S-W ProMar 400 Zero VOC Latex Flat B30W4600 (4 mils wet, 1.4 mils dry per coat)

2. Alkyd Systems
   a. Gloss Finish (Water base)
      1) 1st Coat: S-W Premium Wall & Wood Primer B28W8111 (4 mils wet, 1.6 mils dry)
      2) 2nd Coat: S-W Waterbased Industrial Enamel, B53-300 Series
      3) 3rd Coat: S-W Waterbased Industrial Enamel, B53-300 Series (4 mils wet, 1.6 mils dry per coat)
   b. Semi-Gloss (Solvent base) Finish
      1) 1st Coat: S-W Premium Wall & Wood Primer B28W8111 (4 mils wet, 2 mils dry)
      2) 2nd Coat: S-W ProMar 200 Interior Waterbased Acrylic-Alkyd Semi-Gloss B34-8200
      3) 3rd Coat: S-W ProMar 200 Interior Waterbased Acrylic-Alkyd Semi-Gloss B34-8200 (4 mils wet, 1.7 mils dry per coat)

3. At Wood Handrails:
   a. 1st Coat: S-W SW Multi-Purpose Interior / Exterior Latex Primer B51-450 Series (4 mils wet, 1.4 mils dry)
   b. 2nd and 3rd Coat: S-W B65W181 Hydrogloss Single Component Water Base Urethane
4. Stain & Varnish
   a. Clear Finish
      1) 1st Coat: S-W Minwax 250 VOC Oil Stain (Optional)
      2) 2nd Coat: S-W Wood Classics® Waterborne Polyurethane Varnish, Gloss or Satin
      3) 3rd Coat: S-W Wood Classics® Waterborne Polyurethane Varnish, Gloss or Satin (4 mils wet, 1.0 mil dry per coat)
      4) 1st Coat: S-W Minwax 250 VOC Oil Stain (Optional)
      5) 2nd Coat: S-W Minwax High Build Polyurethane, Gloss, Semi-Gloss, Satin
      6) 3rd Coat: S-W Minwax High Build Polyurethane, Gloss, Semi-Gloss, Satin (4 mils wet, 1.3 mils dry per coat)

I. WOOD (Floors-Painted, Stained, Varnished)
   1. Styrenated Acrylic System
      a. Gloss Finish
         1) 1st Coat: S-W Porch & Floor Enamel, A32 Series
         2) 2nd Coat: S-W Porch & Floor Enamel, A32 Series (4 mils wet, 1.4 mils dry per coat)
      2. Urethane System (solvent base)(light foot traffic)
         a. Gloss Finish
            1) 1st Coat: S-W Minwax 250 VOC Oil Stain (Optional)
            2) 2nd Coat: S-W Minwax High Build Polyurethane, Gloss
            3) 3rd Coat: S-W Minwax High Build Polyurethane, Gloss (4 mils wet, 1.3 mils dry per coat)
   2. Alkyd Systems
      a. Semi-Gloss Finish (Solvent Base)
         1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer B28W2600 (4 mils wet, 1.2 mils dry)
         2) 2nd Coat: S-W ProMar® 400 Latex Gloss, B21W400 Series
         3) 3rd Coat: S-W ProMar® 400 Latex Gloss, B21W400 Series (4 mils wet, 1.5 mils dry per coat)

J. DRYWALL (Walls, Ceilings, Gypsum Board, Plaster Board, etc.)
   1. Latex Systems
      a. Gloss Finish
         1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer B28W2600 (4 mils wet, 1.2 mils dry)
         2) 2nd Coat: S-W ProMar® 400 Latex Gloss, B21W400 Series
         3) 3rd Coat: S-W ProMar® 400 Latex Gloss, B21W400 Series (4 mils wet, 1.5 mils dry per coat)
      b. Semi-Gloss Finish
         1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer B28W2600 (4 mils wet, 1.2 mils dry)
         2) 2nd Coat: S-W ProMar 400 Zero VOC Latex Semi-Gloss B31W4600
         3) 3rd Coat: S-W ProMar 400 Zero VOC Latex Semi-Gloss B31W4600 (4 mils wet, 1.3 mils dry per coat)
      c. Eg-Shel / Satin Finish
         1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer B28W2600 (4 mils wet, 1.2 mils dry)
         2) 2nd Coat: S-W ProMar 400 Zero VOC Latex Eg-Shel B20W4600
         3) 3rd Coat: S-W ProMar 400 Zero VOC Latex Eg-Shel B20W4600 (4 mils wet, 1.6 mils dry per coat)
      d. Flat Finish
         1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer B28W2600 (4 mils wet, 1.2 mils dry)
         2) 2nd Coat: S-W ProMar 400 Zero VOC Latex Flat B30W4600
         3) 3rd Coat: S-W ProMar 400 Zero VOC Latex Flat B30W4600 (4 mils wet, 1.4 mils dry per coat)
2) 2nd Coat: S-W ProMar 200 Interior Waterbased Acrylic-Alkyd Semi-Gloss B34-8200
3) 3rd Coat: S-W ProMar 200 Interior Waterbased Acrylic-Alkyd Semi-Gloss B34-8200(4 mils wet, 1.7 mils dry per coat)

b. Eg-Shel / Satin Finish

1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer B28W2600 (4 mils wet, 1.2 mils dry)
2) 2nd Coat: S-W ProMar 200 Interior Waterbased Acrylic-Alkyd Eg-Shel B33-8200
3) 3rd Coat: S-W ProMar 200 Interior Waterbased Acrylic-Alkyd Eg-Shel B33-8200 (4 mils wet, 1.8 mils dry per coat)

2.05 ATTIC STOCK
A. Provide the following “attic stock” additional product materials at the conclusion of construction for storage on site by the owner:
1. All unused paint materials to be left onsite - materials must be clearly labeled

PART 3 EXECUTION
3.01 PREPARATION
A. Clean surfaces thoroughly and correct defects prior to coating application.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
D. Seal surfaces that might cause bleed through or staining of topcoat.
E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
F. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
G. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
H. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
I. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-SP 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1 (solvent cleaning).
J. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand or power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
K. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
L. Interior Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
M. Interior Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer
has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

N. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

O. Exterior Wood to Receive Transparent Finish: Remove dust, grit, and foreign matter; seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes with tinted exterior calking compound after sealer has been applied. Prime concealed surfaces.

3.02 APPLICATION
A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.

C. Apply products in accordance with manufacturer's instructions.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance.

F. Sand wood and metal surfaces lightly between coats to achieve required finish.

G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

H. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.03 CLEANING
A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.04 PROTECTION
A. Protect finished coatings until completion of project.

B. Touch-up damaged coatings after Substantial Completion.

END OF SECTION
SECTION 10 1400
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Room and door signs.
B. Interior directional and informational signs.
C. Emergency evacuation maps.
D. Building identification signs.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
   1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
   2. When content of signs is indicated to be determined later, request such information from Owner through Architect & Building Systems Engineer at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
   3. Submit for approval by Owner through Architect & Building Systems Engineer prior to fabrication.
D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.
E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

1.04 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING
A. Package signs as required to prevent damage before installation.
B. Store tape adhesive at normal room temperature.

1.06 FIELD CONDITIONS
A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Flat Signs: A. Basis-of-Design Product: Subject to compliance with requirements, provide Stratus style, brushed silver as manufactured by Intersign Corporation, Chattanooga Tn.; or comparable product by an approved supplier.
2.02 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
   1. All signs shall comply with ADA and include Braille.
   2. Comply with ADA section 4.30 regarding character dimensions and borders. Finishes shall be high contrast between the text and sign background with specific light reflectance characteristics as stipulated in ADA 4.30.5.
   3. Required accessible elements shall be identified by the International Symbol of Accessibility at the following locations:
      a. Accessible parking spaces.
      b. Accessible areas of refuge.

B. At each door to an egress stairway, exit passageway and exit discharge, provide a tactile sign stating EXIT and complying with ICC A117.1. Provide sign adjacent to each door to an egress stairway, an exit passageway and the exit discharge.

C. At areas for assisted rescue, signage shall be provided as follows:
   1. Each door providing access to an area of refuge from an adjacent floor area shall be identified by a sign complying with ICC A117.1, stating: AREA OF REFUGE, and including the International Symbol of Accessibility. Where exit sign illumination is required by Section 1011.2, the area of refuge sign shall be illuminated. Additionally, tactile signage complying with ICC A117.1 shall be located at each door to an area of refuge.
   2. Each door providing access to an area of refuge shall be provided with signage instructions on the use of the area under emergency conditions and shall be posted adjoining and aligned with the communications system. See drawings for system mounting height. The instructions shall include all of the following:
      a. Directions to find other means of egress. (Provide arrow pointing In the direction of shortest distance to other exit stating "to other exit")
      b. Persons able to use the exit stairway do so as soon as possible,
      c. unless you are assisting others.
      d. Wait here and use intercom for emergency assistance.
      e. Push button on intercom, speak and wait for assistance.

D. Provide approximately 3 3/4" x 4 3/4" signs at each unit door with three digit numbers.

E. Supply and install one a 4 3/4" x 113/4" directional sign at each floor in clear view of the elevator and or entrance (to be coordinated with the architect) indicating the unit numbers located to each side of the building corridor, with directional arrows pointing to the side the units can be found.

F. Provide 8 ½” x 11” evacuation signs as required by the local building officials and fire marshal. Provide a holder to receive the evacuation drawing (provided by the Architect). Provide a clear matte finish plexiglass cover with a perimeter frame consistent with the specified style.

G. Supply and install one each approximately 4 5/8” x 10” sign with the following verbiage and graphic: (X) indicates quantity
   1. At each Apartment (provide unit number)
   2. Laundry
   3. Mechanical Room

H. Verify sign list, quantity and exact verbiage with owner through submittal process prior to fabrication.

I. Provide and post in a conspicuous place in each section and on each floor of the facility an emergency evacuation sign showing the floor plan indicating all exits and designating egress route from location of sign. Comply with requirements of local code officials.
J. Stairway floor number signs.

K. A sign shall be provided at each floor landing in interior vertical exit enclosures connecting more than three stories designating the floor level, the terminus of the top and bottom of the stair enclosure and the identification of the stair. The signage shall also state the story of, and the direction to the exit discharge and the availability of roof access from the stairway for the fire department. The sign shall be located 5 feet (1524 mm) above the floor landing in a position which is readily visible when the doors are in the open and closed positions.

L. Assembly occupancy spaces with an occupant load of 50 or more shall have the occupant load posted in a conspicuous place, near the main exit or exit access doorway from the room or space.

M. Building Address / Identification Signs:
   1. Use individual metal letters.
   2. Mount on outside wall in location indicated on drawings.

N. Exterior Monument Sign: See drawings.

2.03 SIGN TYPES
   A. Basis of Design: Stratus style, brushed silver as manufactured by Intersign Corporation, Chattanooga Tn.

2.04 DIMENSIONAL LETTERS
   A. Metal Letters:
      1. Mounting: Tape adhesive.

2.05 ACCESSORIES
   A. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 INSTALLATION
   A. Install in accordance with manufacturer's instructions.
   B. Install neatly, with horizontal edges level.
   C. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION
SECTION 10 2800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Commercial toilet accessories.
   B. Residential toilet, shower, and bath accessories.

1.02 RELATED REQUIREMENTS
   A. Section 08 8300 - Mirrors: Other mirrors.
   B. Section 09 3000 - Tiling: Ceramic washroom accessories.

1.03 REFERENCE STANDARDS
   D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
   E. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.

1.04 ADMINISTRATIVE REQUIREMENTS
   A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS
   A. Basis of Design: Franklin Brass and AJ Washroom.
   B. Commercial Toilet, Shower, and Bath Accessories:

2.02 MATERIALS
   A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
      1. Grind welded joints smooth.
      2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.
   B. Stainless Steel Sheet: ASTM A666, Type 304.
   C. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
E. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.
F. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES
A. Stainless Steel: Satin finish, unless otherwise noted.
B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.

2.04 TOILET ACCESSORIES
A. Living Units: (unless otherwise noted items listed are Franklin Brass Kinley Series)
   1. Medicine Cabinet: Broan 615.
   2. Towel Bars (not over 30” in length): KIN24-SN.
   3. Toilet paper Holder - KIN62-SN; KIN20-SN.
   4. Robe Hook - KIN35-SN.
   5. Shower Curtain rod - Franklin Brass 161-5.
   6. Grab bars - Franklin Brass 1 1/2” diameter (powder coated) with snap flanges (concealed fasteners).
      a. At retrofit conditions provide Franklin Brass grab bar anchor for non-stud mount #FB549.
   7. Shower Seats: Surface Mounted Retractable Shower Seat, 3/4” thick, one-piece high density white polymer.
      a. Removable shower seats: Franklin Brass SF598; non slip blow molded polyethylene seat with back; aluminum legs with rubber feet.
      b. Built in shower seats: Reversible folding shower seat and frame; phenolic resin seat with 304 stainless steel brackets. Provide Franklin Brass 5181.
   8. Provide a weighted shower curtain in all roll in shower units. Provide “Elegance of Nylon” by AIM-Co. Inc.; 2220 Corporate Square Blvd.; Jacksonville, FL 32216; Telephone: (904) 725-6396.
   9. Mirror: 1/4” plate glass mirror with pencil edge; size per plans.

B. Public Bathrooms:
   2. Paper Holders - Franklin Brass Century 5508BSF
   3. Robe Hook - Franklin Brass Century 5502SF.
   5. Grab bars - Franklin Brass 1 1/2” diameter (powder coated) with snap flanges (concealed fasteners).
      a. At retrofit conditions provide Franklin Brass grab bar anchor for non-stud mount #FB549.
   6. Mirror, ¼” plate glass - size per plans.

2.05 LAUNDRY ROOM ACCESSORIES
A. Ironing Board: Nutone #AVAD40WN with Nutone surface mount collar #AVDSMN. Install with bottom of surface mount collar at 24” a.f.f. per manufacturer’s recommendations.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify existing conditions before starting work.
B. Verify exact location of accessories for installation.
C. Verify that field measurements are as indicated on drawings.
3.02 INSTALLATION

A. Install accessories in accordance with manufacturers’ instructions in locations indicated on drawings.
B. Install plumb and level, securely and rigidly anchored to substrate.
C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
D. Mounting Heights and Locations: As required by accessibility regulations, as indicated on drawings, and as follows:

END OF SECTION
SECTION 10 4400 - FIRE PROTECTION SPECIALTIES

PART 1 GENERAL
1.01 SECTION INCLUDES
   A. Fire extinguishers.
   B. Fire extinguisher cabinets.
   C. Accessories.

1.02 RELATED REQUIREMENTS
   A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.
   C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
   D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
   E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 FIELD CONDITIONS
   A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS
2.01 MANUFACTURERS
   A. Fire Extinguishers:
      1. Ansul, a Tyco Business; Cleanguard: www.ansul.com/#sle.
      3. Substitutions: See Section 01 6000 - Product Requirements.
   B. Fire Extinguisher Cabinets and Accessories:

2.02 FIRE EXTINGUISHERS
   A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
      2. Finish: Baked polyester powder coat, red color.
      3. Temperature range: Minus 40 degrees F (Minus 40 degrees C) to 120 degrees F (49 degrees C).

2.03 KITCHEN FIRE EXTINGUISHERS
   A. Wet Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gauge.
      1. Class: K type.
      2. Size: 1.6 gallons (6 L).
      4. Temperature range: Minus 20 degrees F (Minus 29 degrees C) to 120 degrees F (49 degrees C).

2.04 FIRE EXTINGUISHER CABINETS
   A. Cabinet Configuration: Recessed type.
      1. Size to accommodate accessories.
      2. Trimless type.
      3. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.
B. Door: 0.036 inch (0.9 mm) metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinge.

C. Door Glazing: Acrylic plastic, clear, 1/8 inch (3 mm) thick, flat shape and set in resilient channel glazing gasket.

D. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

E. Weld, fill, and grind components smooth.

F. Finish of Cabinet Exterior Trim and Door: No. 4 - Brushed stainless steel.

G. Finish of Cabinet Interior: White colored enamel.

2.05 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Extinguisher Theft Alarm: Battery operated alarm, 10 second delay for disarming, activated by opening cabinet door.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, 48 inches (1219.2 mm) from finished floor to to the operable door latch.

C. Secure rigidly in place.

D. Place extinguishers in cabinets.

END OF SECTION
SECTION 10 5723
CLOSET AND UTILITY SHELVING

PART 1  GENERAL

1.01  SECTION INCLUDES
A. Wall mounted wire closet shelving.
B. Accessories.

1.02  SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's data sheets on each product to be used, with installation instructions.
C. Shop Drawings: Provide drawings prepared specifically for this project; show dimensions of shelving and attachment to substrates.

1.03  QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.04  DELIVERY, STORAGE, AND HANDLING
A. Store products in manufacturer's unopened packaging until ready for installation.
B. Store products under cover and elevated above grade.
C. Store flat to prevent warpage and bending.

PART 2  PRODUCTS

2.01  MANUFACTURERS
A. Wire Storage Shelving:
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02  SHELVING APPLICATIONS
A. Shelf Depth: 12 inches (305 mm), unless otherwise indicated.

2.03  MATERIALS
A. Wire Shelving: Factory-assembled coated wire mesh shelf assemblies for wall-mounting, with all components and connections required to produce a rigid structure that is free of buckling and warping.
   1. Construction: Cold-drawn steel wire with average tensile strength of 100,000 psi (690 MPa) resistance welded into uniform mesh units, square, rigid, flat, and free of dents or other distortions, with wires trimmed smooth.
   2. Coating: PVC or epoxy, applied after fabrication, covering all surfaces.
   3. PVC Coating: 9 to 11 mils (0.23 to 0.028 mm) thick.
   4. Epoxy Coating: Non-toxic epoxy-polyester powder coating baked-on finish, 3 to 5 mils (0.76 to 1.27 mm) thick.
   5. Standard Mesh Shelves: Cross deck wires spaced at 1 inch (25.4 mm).
B. Hanging Rod: Tubular steel, 3/4" inch (___ mm) diameter, with end caps on open ends.
   1. Finish: Epoxy powder coat.
   2. Wall Thickness: 20 gage, 0.035 inch (0.89 mm).
   3. Provide corner hanging rods and hanging rod connectors where required.
C. Wall-Mounted Standards: Vertically slotted channel standards with double-tab cantilever brackets to suit shelving; factory finished to match shelving.
D. Mounting Hardware: Provide manufacturer's standard mounting hardware; include support braces, wall brackets, back clips, end clips, poles, and other accessories as required for complete and secure installation; factory finished to match shelving.
   1. Provide intermediate support wall bracket for rod and shelf at any span 4' or more.
E. Fasteners: As recommended by manufacturer for mounting substrates.

PART 3 EXECUTION

3.01 EXAMINATION
A. Inspect areas to receive shelving, to verify that spaces are properly prepared to receive shelf units, and are of dimensions indicated on shop drawings.
B. Verify appropriate fastening hardware.
C. Do not begin installation until substrates have been properly prepared.
D. If substrate preparation is the responsibility of another installer, notify Architect & Building Systems Engineer of unsatisfactory preparation before proceeding.

3.02 PREPARATION
A. Clean surfaces thoroughly prior to installation.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION
A. Install in accordance with manufacturer's instructions, with shelf surfaces level.
B. Cap exposed ends of cut wires.
C. Install back clips, end clips at side walls, and support braces at open ends. Install intermediate support braces as recommended by manufacturer but in no case exceeding 48" between supports.
D. Mounting Heights: See drawings.

3.04 CLEANING
A. Clean soiled surfaces after installation.

3.05 PROTECTION
A. Protect installed work from damage.
B. Touch-up, repair, or replace damaged products before Substantial Completion in a manner that eliminates evidence of replacement.

END OF SECTION
SECTION 11 3013
RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Kitchen appliances.

1.02 RELATED REQUIREMENTS
A. Section 22 1005 - Plumbing Piping: Plumbing connections for appliances.
B. Section 26 0583 - Wiring Connections: Electrical connections for appliances.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.
C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
B. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).
C. Gas Appliances: Bearing design certification seal of American Gas Association (AGA).

1.06 WARRANTY
A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.
C. Provide ten (10) year manufacturer warranty on magnetron tube of microwave ovens.
D. Electric Range: 4 year limited warranty on surface burner elements.
E. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES
A. All Equipment Eligible for Energy Star Rating shall be Energy Star Rated.
B. All ranges shall be provided with, and have installed an anti-tip bracket.
C. Apartment Units: Shall receive one each as follows: (all colors to be selected during construction)
   1. Standard Unit Range: Whirlpool 30" Slide-In Electric Range with Self-Cleaning Oven, Model #: WFC340S0AW
      a. Grease Shield: Baked on enamel finish over steel to match color of range or satin finished stainless steel with matching screws.
   2. Handicap Unit Range: Whirlpool 30" slide-In Electric Range with Self-Cleaning Oven Model #: WEC310SAG
      a. Grease Shield: Satin finished stainless steel with matching screws.
   4. Unit Refrigerator all Units: "Whirlpool" Model No.: W5TXEWFWQ, energy star, 15 cubic foot, frost free. Provide with optional ice maker installed.
D. Dishwasher at standard units: “Whirlpool” Model#: DU810SWPQ, Energy Star, 24” built in.
   1. Dishwasher at HC units: Whirlpool Built-In Dishwasher; Model#: GU3100XTV.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION
   A. Install in accordance with manufacturer's instructions.

3.03 ADJUSTING
   A. Adjust equipment to provide efficient operation.

3.04 CLEANING
   A. Remove packing materials from equipment and properly discard.
   B. Wash and clean equipment.

END OF SECTION
SECTION 12 2113
HORIZONTAL LOUVER BLINDS

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Horizontal slat louver blinds.
   B. Operating hardware.

1.02 RELATED REQUIREMENTS
   A. Section 06 1000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 REFERENCE STANDARDS
   A. WCMA A100.1 - Safety of Corded Window Covering Products; Current Edition, Including All Revisions.

1.04 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Provide data indicating physical and dimensional characteristics.

PART 2 PRODUCTS

2.01 MANUFACTURERS
   A. Horizontal Louver Blinds:
      1. Draper Inc.
      5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 BLINDS
   A. Description: Horizontal slat louvers hung from full-width headrail with full-width bottom rail.
   B. Manual Operation: Control of raising and lowering by cord with full range locking; blade angle adjustable by control wand.
   C. Blinds: Horizontal slat louvers hung from full-width headrail with full-width bottom rail; manual control of raising and lowering by cord with full range locking; blade angle adjustable by control wand; complying with WCMA A100.1.
   D. Plastic Slats: PVC foam, radiused slat corners.
      1. Width: 1 inch (25.4 mm).
      2. Texture: Smooth.
   E. Slat Support: Woven polypropylene cord, ladder configuration.
   F. Head Rail: Pre-finished, formed aluminum box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats.
   G. Bottom Rail: Pre-finished, formed PVC with top side shaped to match slat curvature; with end caps. Color: Same as headrail.
   H. Control Wand: Extruded hollow plastic; hexagonal shape.
   I. Headrail Attachment: Wall brackets.

2.03 FABRICATION
   A. Determine sizes by field measurement.
   B. Fabricate blinds to fit within openings with uniform edge clearance of 1/4 inch (6.35 mm).
   C. Fabricate blinds to cover window frames completely.
PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that openings are ready to receive the work.
   B. Ensure structural blocking and supports are correctly placed. See Section 06 1000.

3.02 INSTALLATION
   A. Install window treatments in accordance with manufacturer's instructions.
   B. Install window treatments level, plumb, square, and true. Allow proper clearances for window operation hardware.
   C. Install the following items to conceal roller and operating mechanism. Do not use exposed fasteners.
      1. Fascias.
      2. Closure panels.
      3. Endcaps.
   D. Secure in place with flush countersunk fasteners.
   E. Place intermediate supports per manufacturer's instructions.

3.03 TOLERANCES
   A. Maximum Variation of Gap at Window Opening Perimeter: 1/4 inch (6 mm).
   B. Maximum Offset From Level: 1/8 inch (3 mm).

3.04 ADJUSTING
   A. Adjust blinds for smooth operation.

3.05 CLEANING
   A. Clean blind surfaces just prior to occupancy.

3.06 TESTING AND DEMONSTRATION
   A. Demonstrate operation of shades to Owner’s designated representatives.

   END OF SECTION
SECTION 12 3530
RESIDENTIAL CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Kitchen cabinets.
B. Vanity cabinets.
C. Casework hardware.

1.02 RELATED REQUIREMENTS
A. Section 12 3600 - Countertops.

1.03 REFERENCE STANDARDS
A. BHMA A156.9 - American National Standard for Cabinet Hardware; 2010.
C. KCMA (DIR) - Directory of Certified Cabinet Manufacturers; current edition, online.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide component dimensions and construction details.
C. Shop Drawings: Indicate casework locations, large scale plans, elevations, clearances required, rough-in and anchor placement dimensions and tolerances.

1.05 QUALITY ASSURANCE
A. Products: Complying with KCMA A161.1 and KCMA Certified.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Residential Casework: Basis of design manufacturers listed below:
   1. Living Units: Cambridge as manufactured by Smart Cabinetry; Maple, White finish
   2. Common Areas: Cambridge as manufactured by Smart Cabinetry; Maple, White finish
   3. Other manufacturers offering equivalent products may be acceptable pending approval from the Architect:
      c. Masco
      e. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COMPONENTS
A. Cabinet Construction: Softwood lumber framing and particle board, tempered hardboard gables.
B. Countertops: As specified in Section 12 3600.
C. Door and Drawer Fronts: Solid wood.
D. Bolts, Nuts, Washers and Screws: Of size and type to suit application.
E. Concealed Joint Fasteners: Threaded steel.
F. Special Components:
   1. Provide plumbing piping shield at common area vanities as detailed on the drawings to match cabinets.
   2. Provide vertical divider panels where shown to match cabinets at edge of dishwashers or other below counter spaces.
2.03 HARDWARE
A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
B. Adjustable Shelf Supports: Standard side/ back-mounted system using 1 inch (25 mm) spacing adjustments.
C. Drawer and Door Pulls:
   1. Product: CONTEMPORARY METAL PULL - 3486, BRUSHED NICKEL, 96mm manufactured by Richelieu.
D. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with satin finish. Where shown on drawings.
E. Drawer Slides:
   1. Type: Full extension.
   2. Static Load Capacity: Commercial grade.
   4. Stops: Integral type.
F. Hinges: European style concealed self-closing type, steel with satin finish.

2.04 FABRICATION
A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
B. Fabricate corners and joints without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.
C. Form smooth edges. Form material for countertops, shelves, and drain boards from continuous sheets.
D. Provide cutouts for plumbing fixtures, appliances, and fixtures and fittings. Prime paint contact surfaces of cut edges.
E. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.05 FINISHES
A. Exposed To View Surfaces: Stain, seal and varnish of selected color.
B. Interior Surfaces: Plastic Laminate of manufacturer's standard color.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify adequacy of support framing.
B. Field Measurements: Verify casework dimensions by field measurements confirming casework can be installed in compliance with the original design and referenced standards.

3.02 INSTALLATION
A. Install casework, components and accessories in accordance with manufacturer's instructions.
B. Use anchoring devices to suit conditions and substrate materials encountered.
C. Set casework items plumb and square, securely anchored to building structure.
D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (1 mm). Use filler strips; not additional overlay trim for this purpose.
E. Close ends of units, back splashes, shelves and bases.

3.03 ADJUSTING
A. Adjust doors, drawers, hardware, fixtures, and other moving or operating parts to function smoothly.
3.04 CLEANING
   A. Clean casework, countertops, shelves, and hardware.

3.05 PROTECTION
   A. Do not permit finished casework to be exposed to continued construction activity.

END OF SECTION
SECTION 12 3600
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Countertops for architectural cabinet work.
B. Countertops for manufactured casework.
C. Wall-hung counters and vanity tops.

1.02 RELATED REQUIREMENTS
A. Section 12 3530 - Residential Casework.
B. Section 22 4000 - Plumbing Fixtures: Sinks.

1.03 REFERENCE STANDARDS
B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.
D. PS 1 - Structural Plywood; 2009.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. 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. Specimen warranty.
C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.
D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

1.05 QUALITY ASSURANCE

1.06 DELIVERY, STORAGE, AND HANDLING
A. Store products in manufacturer's unopened packaging until ready for installation.
B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS
A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS
A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
   1. Provide rounded outside corners.
   2. Back and End Splashes: Same material, same construction; except at handicap units which shall be self edge.
   3. Underside of countertops: Seal with low VOC sealant.
C. Natural Stone Countertops: Stone slabs bonded to substrate; use as large pieces as possible with inconspicuous adhesive joints.
   1. Stone: Granite without cracks, voids, or pin holes; filling with matching epoxy resin is acceptable.
   2. Color: as selected from mid grade or level two granite.
   3. Stone Thickness: 1 inch (1 mm), minimum.
   5. Exposed Edge Treatment: Square profile stone, 1 inch (25 mm) thick, with 3/16 inch (5 mm) radius corner.
   6. Back and End Splashes: Same material, same thickness; for field attachment.
   7. See drawings.

2.02 MATERIALS
A. Wood-Based Components:
   1. Wood fabricated from old growth timber is not permitted.
B. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.
C. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf (20 kg/cu m) minimum density; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.
D. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
E. Joint Sealant: Mildew-resistant silicone sealant, color as selected by Architect.

2.03 FABRICATION
A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to overhang fronts and ends of cabinets 1 inch (25 mm) except where top butts against cabinet or wall.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
   4. Provide radiused outside corners.
B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
   1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
   2. Height: 4 inches (102 mm) standard. Provide 6" height at accessible units and public use common areas unless otherwise indicated.
C. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings, finished to match.

PART 3 EXECUTION
3.01 EXAMINATION
A. Do not begin installation until substrates have been properly prepared.
B. Field Measurements: Verify countertop size and shape prior to fabrication by field measurements taken after base units are installed.
C. If substrate preparation is the responsibility of another installer, notify Architect & Building Systems Engineer of unsatisfactory preparation before proceeding.
D. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION
A. Clean surfaces thoroughly prior to installation.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch (16 mm).

C. Attach wood countertops using screws with minimum penetration into substrate board of 5/8 inch (16 mm).

D. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet (3 mm in 3 m), maximum.

B. Offset From Wall, Countertops: 1/8 inch (3 mm) maximum; 1/16 inch (1.5 mm) minimum.

C. Field Joints: 1/8 inch (3 mm) wide, maximum.

3.05 CLEANING

A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION
SECTION 22 0050
PLUMBING EXECUTION

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Definitions.
   2. Coordination.
   3. Piping materials and installation instructions common to most piping systems.
   4. Dielectric fittings.
   5. Mechanical sleeve seals.
   7. Escutcheons.
   8. Grout.
  10. Equipment installation requirements common to equipment sections.
  11. Concrete bases.
  12. Supports and anchorages.

1.02 DEFINITIONS

A. Finished Spaces: Spaces other than plumbing and electrical equipment rooms, furred spaces, pipe 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 plumbing 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 in 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.

1.03 COORDINATION

A. Coordination: Coordinate construction operations to ensure efficient and orderly installation of the Work.
   1. Coordinate construction operations, that depend on each other for proper installation, connection, and operation.
   2. 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.
   3. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
   4. Make adequate provisions to accommodate items scheduled for later installation.
   5. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components.

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 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 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.
9. Project closeout activities.

1.04 SUBMITTALS

A. Alternate Products: Alternate manufacturers, equipment and/or products must be specified or approved prior to bid in writing via addendum to be accepted. All costs associated with deviations from the basis of design shall be borne by the contractor. Deviations shall include alternate manufacturer and/or alternate product and shall include all significant dimensional, performance, electrical, or installation differences from the basis of design products. Costs for reimbursement shall include the costs of other trades affected, and shall include all engineering costs to evaluate such deviations.

B. Substitutions: Unspecified manufacturers shall be considered substitutions and shall be submitted for consideration under the specified substitution procedures. Substitutions shall be submitted to the engineer for evaluation. If approved by the engineer, substitution shall be offered to the owner for consideration. All costs associated with substitutions shall be borne by the contractor. Costs for reimbursement shall include the costs of other trades affected, and shall include all engineering costs to evaluate such deviations.

C. Coordination Drawings: Prepare Coordination Drawings (coordinated shop drawings) to maximize utilization of space for efficient installation of different components and for installation of products and materials fabricated by separate entities. Submit to Engineer for review before starting work.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
   a. Indicate functional and spatial relationships of components of the work with all other systems and trades.
   b. Indicate required installation sequences.
   c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide sketches of proposed alternate construction to Engineer for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

D. 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 and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project. Submit to Engineer before starting work.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

E. Make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements.
F. If equipment is submitted which differs in arrangement from that shown, provide drawings that show the rearrangement of all associated systems. Approval will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract.

G. Prior to submitting shop drawings for review, contractor shall certify in writing that manufacturers of all major items of equipment have each reviewed drawings and specifications, and have jointly coordinated and properly integrated their equipment and controls to provide a complete and efficient installation.

1.05 WARRANTIES
A. All work shall include a parts and labor warranty on materials and workmanship for a period of 1 year.
B. Refer to Division 01 for additional warranty requirements.

PART 2 PRODUCTS

2.01 SLEEVES
A. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
B. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop.
C. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include underdeck clamp, clamping ring with set screws, nuts, and bolts for membrane flashing.
D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.02 GROUT
A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
   2. Design Mix: 5000-psi, 28-day compressive strength.

2.03 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.

2.04 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.

2.05 PIPE, TUBE, AND FITTINGS
A. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.
2.06 JOINING MATERIALS
A. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
B. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
D. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.
E. Welding Filler Metals: Comply with AWS D10.12.
F. 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.

2.07 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.

PART 3 EXECUTION
3.01 PLUMBING DEMOLITION
A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.
B. Contractor shall be responsible for all work and costs associated with demolition shown or noted on plans.
C. Verify exact requirements before bid and include direct and related indirect costs in estimate including permit application, fees, dust control, protection of existing, temporary HVAC, fuel usage, scaffolding, disconnection, disposal, cutting and patching.
D. Occupied Buildings: For occupied buildings, coordinate with local management for communication with building users, occupants, and/or residents regarding potential for disruptions, and provide 72 hour advance notification for planned outages. Install new work to the fullest extent possible before interrupting existing services to minimize disruption to residents. For water, domestic hot water, sanitary and gas/propane services to dwelling units, perform work during off hours (12:00 AM to 6:00 AM) during outages to minimize disruption to residents. Provide temporary piping and/or equipment for water, gas, and sanitary services to the building for disruptions lasting over 4 hours.
E. In performing the work:
   1. Coordinate with existing conditions and other trades before starting work.
   2. Remove portions of walls, floors, ceilings, etc. required for access to demolished and new work.
   3. Disconnect, demolish, and remove systems, equipment, and components indicated to be removed.
   4. Piping to Be Removed: Remove portion indicated to be removed and cap or plug remaining with same or compatible piping material.
5. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.


7. Equipment to Be Removed and Reinstalled: Arrange for disconnection of electrical power. Disconnect and cap services and remove, clean, and store equipment. When appropriate, reinstall, reconnect, arrange for power connection and make equipment operational.

8. Equipment to Be Removed and Salvaged: Arrange for disconnection of electrical power. Disconnect and cap services, remove equipment and deliver to Owner.

F. If new or existing to remain products are damaged during demolition, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

G. Subcontract the General Contractor to perform patching, repair or replacement of walls, floors, ceilings, etc. removed for access to the work. General contractor shall repair finishes to match surrounding finishes.

3.02 COMMON REQUIREMENTS

A. Install according to manufacturer requirements and other Division specification sections.

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. Where located within walls and other concealed areas subject to damage, provide suitable protection.

D. Piping indicated to be exposed and piping in equipment rooms and service areas shall be 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 and equipment with clearances to permit servicing.

G. Install piping at indicated slopes free of sags and bends and with fittings for branch connections and changes in direction.

H. Install piping to allow application of insulation.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Contact manufacturer's representative to visit site and observe installation in order to confirm installation requirements and warranty coverage. Document observation in writing and include in O&M manuals.

K. Provide service and maintenance for not less than one year from the Date of Substantial Completion or for the warranty period specified in Division 01, whichever is longer. Refer to Division 01 for additional service and requirements.

3.03 PENETRATIONS

A. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls. Sleeve ends shall be flush with both wall surfaces unless otherwise noted. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Concrete and masonry penetrations: seal space outside of sleeves with grout. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

B. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
C. **Roof-Penetrations**: Seal penetration of roof with flexible boot-type flashing units applied in coordination with roofing work.

D. **Aboveground, Exterior-Wall Pipe Penetrations**: Position pipe in center of sleeve. Maintain 1% outward slope, unless otherwise indicated. Seal penetrations using non-expanding foam. After cured, trim flush with sleeve end and paint with color to match surrounding finish.

E. **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.

F. **Fire-Rated-Assembly Penetrations**: Maintain indicated fire rating of walls, partitions, ceilings, and floors at. Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07. "Comply with requirements in Division 07."

G. **Apply firestopping to non-ducted penetrations of fire and/or smoke rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07.**

H. **Penetrations of membranes of rated walls shall be protected by UL listed products. Coordinate exact installation conditions with selected fire sealants supplier. For penetrations which do not have a standard UL installation detail, arrange for engineering determination from damper manufacturer and/or sealant supplier and provide modifications required to match detail.**

I. **Install escutcheons for penetrations of walls, ceilings, and floors.**

### 3.04 PIPING 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 pipe and fittings before assembly.**

C. **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. **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.

F. **Welded Joints**: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

G. **Flanged Joints**: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

H. **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.
I. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
J. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.
K. 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.
L. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.05 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.

3.06 INSTALLATION - COMMON REQUIREMENTS
A. Install equipment, fixtures, valves and specialties according to manufacturer installation instructions and recommendations.
B. Refer to other Sections of these Specifications for additional requirements.
C. Install to allow maximum possible headroom unless specific mounting heights are indicated.
D. Install work level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
E. Install work 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.
F. Install work to allow right of way for piping installed at required slope.
G. Contact equipment manufacturer's representative to visit site and observe installation in order to confirm installation requirements and warranty coverage. Document observation in writing and include in O&M manuals.
H. Provide service and maintenance for not less than one year from the Date of Substantial Completion or for the warranty period specified in Division 01, whichever is longer. Refer to Division 01 for additional service and requirements.

3.07 CONCRETE BASES
A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
   1. Provide concrete bases which are plumb, level and fully supported to prevent shifting over time.
   2. Provide concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
   3. Place and secure anchorage devices. Install according to equipment manufacturer's recommendations, setting drawings, templates, diagrams, instructions, and directions for supported equipment. Provide anchor bolts according to anchor-bolt manufacturer's written instructions. Install anchor bolts to elevations required for proper attachment to supported equipment. Unless otherwise noted, install epoxy-coated anchor bolts to match equipment that extend through concrete base, and anchor into structural concrete.
4. Where located on structural floor, provide dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.

5. Provide 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.08 SUPPORTS AND ANCHORAGES
   A. Provide supports to match construction type and adjacent assembly rating.
   B. For combustible construction, provide wood supports and anchorages. Cut, fit, and place nailers, blocking, and anchorages to support, and anchor materials and equipment. Select fasteners that will not penetrate members to opposite side. Tighten connections between members. Install fasteners without splitting wood members.
   C. For non-combustible building construction provide metal supports and anchorages. Refer to Division 05 Section "Metal Fabrications" for structural steel. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment. Field Welding shall comply with AWS D1.1.
   D. Attach to substrates as required to support applied loads.

3.09 GROUTING
   A. Clean surfaces that will come into contact with grout. Provide forms as required for placement of grout.
   B. Mix and install grout for HVAC equipment base bearing surfaces, and anchors.
   C. Place grout around anchors and completely filling equipment base and provide smooth bearing surface for equipment. Avoid air entrapment during placement of grout.
   D. Allow grout to cure before loading or applying forces.

3.10 SLEEVE-SEAL INSTALLATION
   A. Install to seal below-grade exterior wall penetrations.
   B. Use 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 pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION
SECTION 22 0516
EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Flexible pipe connectors.
   B. Pipe loops, offsets, and swing joints.

1.02 RELATED REQUIREMENTS
   A. Section 22 1005 - Plumbing Piping.

1.03 REFERENCE STANDARDS
   B. EJMA (STDS) - EJMA Standards; Tenth Edition.

1.04 SUBMITTALS
   A. Refer to Division 01 - Administrative Requirements, for submittal procedures.
   B. Project Record Documents: Record installed locations of flexible pipe connectors, expansion joints, anchors, and guides.

PART 2 PRODUCTS

2.01 FLEXIBLE PIPE CONNECTORS
   A. Manufacturers:
      3. Substitutions: See Section 01 6000 - Product Requirements.
   B. Inner Hose: Stainless steel.
   D. Pressure Rating: 125 psi and 450 degrees F (862 kPa and 232 degrees C).
   E. Joint: As specified for pipe joints.
   F. Size: Use pipe sized units.
   G. Maximum offset: 3/4 inch (20 mm) on each side of installed center line.

2.02 FLEXIBLE JOINTS AND LOOPS - HOSE AND BRAID
   A. Provide flexible loops with two flexible sections of hose and braid, two 90 degree elbows, and 180 degree return with support bracket and air release or drain plug.
   B. Provide flexible loops capable of movement in the x, y, and z planes. Flexible loops to impart no thrust loads to the building structure.
   C. Flexible Connectors: Flanged, braided type with wetted components of stainless steel, sized to match piping.
      1. Maximum Allowable Working Pressure: 150 psig (1030 kPa) at 120 degrees F (49 degrees C).
      2. End Connections: Same as specified for pipe jointing.
      3. Provide necessary accessories including, but not limited to, swivel joints.

PART 3 EXECUTION

3.01 INSTALLATION
   A. Install in accordance with manufacturer's instructions.
   B. Install in accordance with EJMA (Expansion Joint Manufacturers Association) Standards.
   C. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.
D. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.

E. Provide support and pipe loops to control expansion and contraction of piping. Provide where straight run > 50' to allow 3" of expansion per 50' of length for DCW, .6" per 50' for DHW.

F. Substitute grooved piping for vibration isolated equipment instead of flexible connectors. Grooved piping need not be anchored.

END OF SECTION
SECTION 22 0519
METERS AND GAUGES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Pressure gauges and pressure gauge taps.
B. Thermometers and thermometer wells.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS
A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.
D. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

1.04 SUBMITTALS
A. Refer to Division 01 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

PART 2 PRODUCTS

2.01 PRESSURE GAUGES
A. Manufacturers:
   4. Substitutions: Refer to Division 01 - Product Requirements.
B. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
   1. Case: Steel with brass bourdon tube.
   2. Size: 4-1/2 inch (115 mm) diameter.
   3. Mid-Scale Accuracy: One percent.

2.02 PRESSURE GAUGE TAPPINGS
A. Gauge Cock: Tee or lever handle, brass for maximum 150 psi (1034 kPa).
B. Needle Valve: Brass, 1/4 inch (6 mm) NPT for minimum 150 psi (1034 kPa).
C. Pulsation Damper: Pressure snubber, brass with 1/4 inch (6 mm) connections.
D. Syphon: Steel, Schedule 40, 1/4 inch (6 mm) angle or straight pattern.

2.03 STEM TYPE THERMOMETERS
A. Manufacturers:
   4. Substitutions: Refer to Division 01 - Product Requirements.
B. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
1. Size: 9 inch (225 mm) scale.
2. Window: Clear Lexan.
3. Accuracy: 2 percent, per ASTM E77.
4. Calibration: Degrees F.

2.04 DIAL THERMOMETERS
A. Manufacturers:
   4. Substitutions: Refer to Division 01 - Product Requirements.
B. Thermometers - Adjustable Angle: Dial type bimetallic actuated; ASTM E1; stainless steel case, adjustable angle with front recalibration, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
   1. Size: 5 inch (125 mm) diameter dial.
   2. Accuracy: 1 percent.
   3. Calibration: Degrees F.

2.05 THERMOMETER SUPPORTS
A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.
B. Flange: 3 inch (75 mm) outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.06 TEST PLUGS
A. Test Plug: 1/4 inch (6 mm) or 1/2 inch (13 mm) brass fitting and cap for receiving 1/8 inch (3 mm) outside diameter pressure or temperature probe with neoprene core for temperatures up to 200 degrees F (93 degrees C).

2.07 STATIC PRESSURE GAUGES
A. Manufacturers:
   4. Substitutions: Refer to Division 01 - Product Requirements.
B. 3-1/2 inch (90 mm) diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.
C. Accessories: Static pressure tips with compression fittings for bulkhead mounting, 1/4 inch (6 mm) diameter tubing.

PART 3 EXECUTION
3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions.
B. Install pressure gages with pulsation dampers. Provide gage cock to isolate each gage. Extend nipples and siphons to allow clearance from insulation.
C. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch (60 mm) for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
D. Provide instruments with scale ranges selected according to service with largest appropriate scale.
E. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
F. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

G. Locate test plugs adjacent thermometers and thermometer sockets.

3.02 SCHEDULES

A. Pressure Gauges, Location and Scale Range:
   1. Pumps, 0 to 100 psi (0 to _____ kPa).
   2. Expansion tanks, 0 to 100 psi (0 to _____ kPa).
   3. Standpipe, highest points, 0 to 150 psi (0 to _____ kPa).
   4. Standpipe and sprinkler water supply connection, 0 to 100 psi (0 to _____ kPa).
   5. Sprinkler system, 0 to 100 psi (0 to _____ kPa).
   6. Pressure reducing valves, 0 to 100 psi (0 to _____ kPa).
   7. Backflow preventers, 0 to 100 psi (0 to _____ kPa).

B. Pressure Gauge Tappings, Location:
   1. Boiler - inlets and outlets.

C. Thermometers, Location and Scale Range:
   1. Headers to central equipment, 0 to 150 degrees F (0 to _____ Degrees C).
   2. Domestic hot water supply and recirculation, 0 to 150 degrees F (0 to _____ Degrees C).

END OF SECTION
SECTION 22 0523
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Applications.
B. General requirements.
C. Ball valves.
D. Butterfly valves.
E. Check valves.
F. Gate valves.
G. Plug valves.

1.02 REFERENCE STANDARDS
A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
B. ASME B31.9 - Building Services Piping; 2014.
F. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2015.
H. MSS SP-70 - Cast Iron Gate Valves, Flanged and Threaded Ends; 2011.
I. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends; 2011.
J. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.
K. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.

1.03 SUBMITTALS
A. Refer to Division 01 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

1.04 QUALITY ASSURANCE
A. Manufacturer:
   1. Obtain valves for each valve type from single manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING
A. Prepare valves for shipping as follows:
   1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
   2. Protect valve parts exposed to piped medium against rust and corrosion.

PART 2 PRODUCTS

2.01 APPLICATIONS
A. See drawings for specific valve locations.
B. Provide the following valves for the applications if not indicated on drawings:
   1. Shutoff: Ball, butterfly, gate or plug.
2. Throttling: Provide ball type balancing valve with gauge taps and scale.

C. Substitutions of valves with higher CWP classes or SWP ratings for same valve types are permitted when specified CWP ratings or SWP classes are not available.

D. Domestic, Hot and Cold Water Valves:
   1. 2 NPS (50 DN) and Smaller:
      a. Bronze: Provide with solder-joint or threaded ends.
      b. Ball: One piece, full port, bronze with brass trim.
      c. Bronze Swing Check: Class 125, bronze disc.
      d. Bronze Gate: Class 125, NRS.
   2. 2-1/2 NPS (65 DN) and Larger:
      a. Iron, 2-1/2 NPS (65 DN) to 4 NPS (100 DN): Provide with threaded or flanged ends.
      b. Iron Grooved-End Butterfly: 175 CWP.
      c. Iron Gate: Class 125, NRS.

2.02 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types.

D. Valves in Insulated Piping: With 2 NPS (50 DN) stem extensions and the following features:
   1. Gate Valves: Rising stem.
   2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
   4. Memory Stops: Fully adjustable after insulation is installed.

E. Valve-End Connections.

F. General ASME Compliance:


H. Bronze Valves:
   1. Fabricate from dezincification resistant material.
   2. Copper alloys containing more than 15 percent zinc are not permitted.

I. Source Limitations: Obtain each valve type from a single manufacturer.

2.03 BRONZE BALL VALVES

A. One Piece, Reduced Port with Bronze Trim:
   1. Comply with MSS SP-110.
   2. SWP Rating: 400 psig (2760 kPa).
   3. CWP Rating: 600 psig (4140 kPa).
   5. Ends: Threaded.
   6. Seats: PTFE or TFE.
   7. Stem: Bronze.
   8. Ball: Chrome plated brass.

B. Two Piece, Full Port with Bronze Trim:
   1. Comply with MSS SP-110.
   2. SWP Rating: 150 psig (1035 kPa).
   3. CWP Rating: 600 psig (4140 kPa).
   5. Ends: Threaded.
6. Seats: PTFE or TFE.
7. Stem: Bronze.
8. Ball: Chrome plated brass.

2.04 IRON, GROOVED-END BUTTERFLY VALVES
A. CWP Rating: 175 psig (1200 kPa).
   1. Comply with MSS SP-67, Type I.
   2. Body: Coated ductile iron.
   4. Disc: Coated ductile iron.
   5. Disc Seal: EPDM.

2.05 BRONZE LIFT CHECK VALVES
A. Class 125:
   1. Comply with MSS SP-80, Type 1, Metal Disc to Metal Seat and Type 2, Nonmetallic Disc to Metal Seat.
   2. CWP Rating: 200 psig (1380 kPa).
   3. Design: Vertical flow.
   5. Ends: Threaded as indicated.

2.06 BRONZE SWING CHECK VALVES
A. Class 125: CWP Rating: 200 psig (1380 kPa).
   1. Comply with MSS SP-80, Type 3.
   2. Design: Horizontal flow.
   4. Ends: Threaded as indicated.
   5. Disc: Bronze.

2.07 BRONZE GATE VALVES
A. Non-Rising Stem (NRS) or Rising Stem (RS):
   1. Comply with MSS SP-80, Type I.
   2. Class 125: CWP Rating: 200 psig. (1380 kPa)
   4. Ends: Threaded or solder joint joint.
   5. Stem: Bronze.
   7. Packing: Asbestos free.
   8. Handwheel: Malleable iron, bronze, or aluminum.

2.08 IRON GATE VALVES
A. NRS or OS & Y:
   1. Comply with MSS SP-70, Type I.
   2. Class 125: CWP Rating: 200 psig. (1380 kPa)
   5. Trim: Bronze.
   7. Packing and Gasket: Asbestos free.

2.09 LUBRICATED PLUG VALVES
A. Regular Gland with Flanged Ends:
   1. Comply with MSS SP-78, Type II.
   4. Body: ASTM A48/A48M or ASTM A126, cast iron with lubrication sealing system.
5. Pattern: Regular or short.
6. Plug: Cast iron or bronze with sealant groove.

PART 3 EXECUTION

3.01 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.
B. Verify valve parts to be fully operational in all positions from closed to fully open.
C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.
C. Install check valves where necessary to maintain direction of flow as follows:
   1. Swing Check: Install horizontal maintaining hinge pin level.

END OF SECTION
SECTION 22 0553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Nameplates.
B. Tags.
C. Stencils.
D. Pipe markers.
E. Ceiling tacks.

1.02 RELATED REQUIREMENTS
A. Section 09 9123 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
A. Refer to Division 01 - Administrative Requirements, for submittal procedures.
B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
D. Product Data: Provide manufacturers catalog literature for each product required.
E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
F. Project Record Documents: Record actual locations of tagged valves.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS
B. Piping: Tags.
C. Pumps: Nameplates.
D. Tanks: Nameplates.
E. Valves: Tags and ceiling tacks where located above lay-in ceiling.
F. Water Treatment Devices: Nameplates.

2.02 NAMEPLATES
A. Description: Laminated three-layer plastic with engraved letters.
   2. Letter Height: 1/4 inch (6 mm).

2.03 TAGS
A. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch (40 mm) diameter with smooth edges.

2.04 STENCILS
A. Stencils: With clean cut symbols and letters of following size:
   1. 3/4 to 1-1/4 inch (20-30 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 1/2 inch (15 mm) high letters.
   2. 1-1/2 to 2 inch (40-50 mm) Outside Diameter of Insulation or Pipe: 8 inch (200 mm) long color field, 3/4 inch (20 mm) high letters.
3. 2-1/2 to 6 inch (65-150 mm) Outside Diameter of Insulation or Pipe: 12 inch (300 mm) long color field, 1-1/4 inch (30 mm) high letters.

2.05 PIPE MARKERS
   A. Comply with ASME A13.1.
   B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
   C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
   D. Color code as follows:
      1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters.
      2. Flammable Fluids: Yellow with black letters.

2.06 CEILING TACKS
   A. Description: Steel with 3/4 inch (20 mm) diameter color coded head.
   B. Color code as follows:
      1. Plumbing Valves: Green.

PART 3 EXECUTION

3.01 PREPARATION
   A. Degrease and clean surfaces to receive adhesive for identification materials.
   B. Prepare surfaces in accordance with Section 09 9123 for stencil painting.

3.02 INSTALLATION
   A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
   B. Install tags with corrosion resistant chain.
   C. Apply stencil painting in accordance with Section 09 9123.
   D. Install plastic pipe markers in accordance with manufacturer's instructions.
   E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
   F. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
      1. Identify service, flow direction, and pressure.
      2. Install in clear view and align with axis of piping.
      3. Locate identification not to exceed 20 feet (6 m) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
   G. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION
SECTION 22 0719
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Piping insulation.
B. Jackets and accessories.

1.02 RELATED REQUIREMENTS
A. Section 07 8400 - Firestopping.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
A. Refer to Division 01 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.05 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
B. Applicator Qualifications: Company specializing in performing the type of work specified in this section and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Accept materials on site, labeled with manufacturer’s identification, product density, and thickness.

1.07 FIELD CONDITIONS
A. Maintain ambient conditions required by manufacturers of each product.
B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS
A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER
A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.
   1. ‘K’ (‘Ksi’) Value: ASTM C177, 0.23 at 75 degrees F (0.034 at 24 degrees C).
3. Maximum Moisture Absorption: 0.2 percent by volume.

2.03 POLYETHYLENE
A. Manufacturers:
   1. Armacell LLC: www.armacell.us.
   2. Substitutions: Refer to Division 01 - Product Requirements.
B. Insulation: Flexible closed-cell polyethylene tubing, slit lengthwise for installation, complying with applicable requirements of ASTM D1056.
   1. ‘K’ (‘Ksi’) Value: ASTM C177; 0.25 at 75 degrees F (0.036 at 24 degrees C).
   3. Density: 2 lb/cu ft (32 kg/cu m).
   4. Maximum Moisture Absorption: 1.0 percent by volume.
   5. Moisture Vapor Permeability: 0.05 perm inch (0.073 ng/Pa s m), when tested in accordance with ASTM E96/E96M.
   6. Connection: Contact adhesive.

2.04 FLEXIBLE ELASTOMERIC CELLULAR INSULATION
A. Manufacturer:
   3. Substitutions: Refer to Division 01 - Product Requirements.
B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 3; use molded tubular material.
   1. ‘K’ Value: ASTM C534; 0.25 at 75 degrees F.
   2. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.05 JACKETS
A. PVC Plastic.
   1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F (Minus 18 degrees C).
      b. Maximum Service Temperature: 150 degrees F (66 degrees C).
      c. Moisture Vapor Permeability: 0.002 perm inch (0.0029 ng/Pa s m), maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil (0.25 mm).
      e. Connections: Brush on welding adhesive.
B. Canvas Jacket: UL listed 6 oz/sq yd (220 g/sq m) plain weave cotton fabric treated with dilute fire retardant lagging adhesive.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that piping has been tested before applying insulation materials.
B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION
A. Install in accordance with manufacturer’s instructions.
B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.
C. Exposed Piping: Locate insulation with seams in least visible locations.
D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

E. For hot piping conveying fluids 140 degrees F (60 degrees C) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.

F. For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment using preformed fitting covers.

G. Glass fiber insulated pipes conveying fluids above ambient temperature:
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

H. Inserts and Shields:
   1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert Location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 8400.

J. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet (3 meters) above finished floor): Finish with canvas jacket sized for finish painting.

3.03 SCHEDULES

A. Plumbing Systems:
   1. Domestic Hot Water Supply.
      a. Glass Fiber Insulation:
         1) Pipe Size Range: All sizes.
         2) Thickness: 1 inch (____ mm).
      b. Hydrous Calcium Silicate Insulation: Pipe hanger saddles.
   2. Domestic Hot Water Recirculation:
      a. Glass Fiber Insulation:
         1) Pipe Size Range: All sizes.
         2) Thickness: 1 inch (25 mm).
      b. Polyethylene Insulation:
         1) Pipe Size Range: All sizes.
         2) Thickness: 1 inch (25 mm).
   3. Domestic Cold Water:
      a. closed cell elastomeric or polyethylene.
      b. 1/2" thick.
   4. Roof Drain Bodies.
   5. Roof Drainage Above Grade.
   6. Roof Drainage Within 10 Feet (3 Meters) of the Exterior:
      a. closed cell elastomeric or polyethylene.
      b. 1/2" thick.
   7. Roof Drainage Run Horizontal at Roof Level.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe, pipe fittings, specialties, and connections for piping systems:
   1. Sanitary sewer.
   2. Domestic water.
   3. Natural Gas Piping
   4. Flanges, unions, and couplings.
   5. Pipe hangers and supports.
   6. Valves.
   7. Flow controls.

1.02 REFERENCE STANDARDS

C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
F. ASME B31.9 - Building Services Piping; 2014.
I. ASSE 1003 - Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems; 2009.
O. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2013.


AQ. AWWA C651 - Disinfecting Water Mains; 2005.


AS. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.

AT. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

AV. PPI TR-4 - PPI Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB), and Minimum Required Strength (MRS) Ratings For Thermoplastic Piping Materials or Pipe; 2013.

1.03 SUBMITTALS
A. Refer to Division 01 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
C. Project Record Documents: Record actual locations of valves.

1.04 QUALITY ASSURANCE
A. Perform work in accordance with applicable codes. Coordinate inspections to allow adequate time for review and approval before piping system concealment.
B. Valves: Manufacturer's name and pressure rating marked on valve body.
C. Welding Materials and Procedures: Conform to ASME BPVC-IX and applicable state labor regulations.
D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.
E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.05 DELIVERY, STORAGE, AND HANDLING
A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
B. Provide temporary protective coating on cast iron and steel valves.
C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.06 FIELD CONDITIONS
A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS
2.01 GENERAL REQUIREMENTS
A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING
A. ABS Pipe: ASTM F628.
   1. Fittings: ABS.
B. ABS Pipe: ASTM D2661.
   1. Fittings: ABS.
C. PVC Pipe: ASTM D2665 or ASTM D3034.
   1. Fittings: PVC.

2.03 SANITARY SEWER PIPING, ABOVE GRADE
A. ABS Pipe: ASTM F628.
   1. Fittings: ABS.
B. ABS Pipe: ASTM D2661.
   1. Fittings: ABS.

C. PVC Pipe: ASTM D2729.
   1. Fittings: PVC.

D. PVC Pipe: ASTM D2665.
   1. Fittings: PVC.

E. PVC Pipe: ASTM D1785 Schedule 40, or ASTM D2241 SDR 26 with not less than 150 psi (1034 kPa) pressure rating.
   1. Fittings: ASTM D2466, PVC.

2.04 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET (1500 MM) OF BUILDING

   1. Fittings: Ductile or gray iron, standard thickness.
   2. Joints: AWWA C111/A21.11, styrene butadiene rubber (SBR) or vulcanized SBR gasket with 3/4 inch (19 mm) diameter rods.

B. PE Pipe: ASTM D2239.
   1. Fittings: ASTM D2609, PE.
   2. Joints: Mechanical with stainless steel clamp.

2.05 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.

B. CPVC Pipe (only 1" and smaller if approved by Owner and Engineer): ASTM D2846/D2846M, ASTM F441/F441M, or ASTM F442/F442M.

C. Cross-Linked Polyethylene Pipe (only 1" and smaller if approved by Owner and Engineer): ASTM F876 or ASTM F877.
   1. Manufacturers:
      b. Substitutions: Refer to Division 01 - Product Requirements.
   2. PPI TR-4 Pressure Design Basis:
      a. 80 psig (551 kPa) at maximum 200 degrees F (93 degrees C).
   4. Joints: ASTM F1960 cold-expansion fittings (Crimp fittings are not permitted).

2.06 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   2. Joints: Threaded or welded to ASME B31.1.

2.07 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches (80 mm) and Under:
   1. Ferrous pipe: Class 150 malleable iron threaded unions.
   2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.08 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.

3. Trapeze Hangers: Welded steel channel frames attached to structure.


5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.

6. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
   b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
   d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
   e. Height: Provide minimum clearance of 6 inches (150 mm) under pipe to top of roofing.

B. Plumbing Piping - Drain, Waste, and Vent:

1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.

2. Hangers for Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.

3. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.

4. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.

5. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

C. Plumbing Piping - Water:

1. Hangers for Pipe Sizes 1/2 Inch (15 mm) to 1-1/2 Inches (40 mm): Malleable iron, adjustable swivel, split ring.

2. Hangers for Cold Pipe Sizes 2 Inches (50 mm) and Over: Carbon steel, adjustable, clevis.

3. Hangers for Hot Pipe Sizes 2 Inches (50 mm) to 4 Inches (100 mm): Carbon steel, adjustable, clevis.

4. Hangers for Hot Pipe Sizes 6 Inches (150 mm) and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.

5. Wall Support for Pipe Sizes to 3 Inches (80 mm): Cast iron hook.

6. Wall Support for Pipe Sizes 4 Inches (100 mm) and Over: Welded steel bracket and wrought steel clamp.

7. Wall Support for Hot Pipe Sizes 6 Inches (150 mm) and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.

8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

9. Floor Support for Hot Pipe Sizes to 4 Inches (100 mm): Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.

10. Floor Support for Hot Pipe Sizes 6 Inches (150 mm) and Over: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.

11. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners.

2.09 BALL VALVES

A. Construction, 4 Inches (100 mm) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port,
teflon seats and stuffing box ring, blow-out proof stem, lever handle, solder or threaded ends with union.

2.10 PIPING SPECIALTIES

A. Flow Control:
   1. Manufacturers:
      a. Caleffi [Thermosetter].
      b. Substitutions: Refer to Division 01 - Product Requirements.
   2. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
   3. Thermostatic Valve Performance: Automatic control of flow temperature within .5 degree of selected rating, over operating pressure range of 10 times minimum pressure required for control.

2.11 WATER PRESSURE REDUCING VALVES

A. Manufacturers:
   1. Caleffi
   3. Zurn
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Up to 2 Inches (50 mm):
   1. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.

C. Quality Assurance:
   1. Regulate pressures to remain between 40 psi and 80 psi at all points of delivery.
   2. Do not exceed 3-6 feet per second at full flow to prevent excessive wear.
   3. Do not exceed 15 psi pressure drop at rated flow.

2.12 RELIEF VALVES

A. Temperature and Pressure:
   1. Manufacturers:
      b. Substitutions: Refer to Division 01 - Product Requirements.
   2. ANSI Z21.22, AGA certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F (98.9 degrees C), capacity ASME BPVC-IV certified and labelled.

2.13 STRAINERS

A. Manufacturers:
   2. Substitutions: Refer to Division 01 - Product Requirements.

B. Size 2 inch (50 mm) and Under:
   1. Threaded brass body for 175 psi (1200 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.
   2. Class 150, threaded bronze body 300 psi (2070 kPa) CWP, Y pattern with 1/32 inch (0.8 mm) stainless steel perforated screen.

C. Size 1-1/2 inch (40 mm) to 4 inch (100 mm):
   1. Class 125, flanged iron body, Y pattern with 1/16 inch (1.6 mm) stainless steel perforated screen.

2.14 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. MIFAB, Inc.
b. PPP Inc.
c. Sioux Chief Manufacturing Company, Inc.
e. Watts Industries, Inc.; Water Products Div.

5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

2.15 TRAP-SEAL PRIMER SYSTEMS

A. Trap-Seal Primer Systems:
2. Piping: NPS 3/4, ASTM B 88, Type L; copper, water tubing.
3. Cabinet: Recessed-mounting steel box with stainless-steel cover.
4. Electric Controls: 24-hour timer, solenoid valve, and manual switch for 120-V ac power.
7. Size Outlets: NPS 1/2.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
B. Remove scale and dirt, on inside and outside, before assembly.
C. Prepare piping connections to equipment with flanges or unions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
E. Group piping whenever practical at common elevations.
F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 22 0516.
G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
H. Provide access where valves and fittings are not exposed.
   1. Coordinate size and location of access doors with Section 08 3100.
I. Establish elevations of buried piping outside the building to ensure not less than 3 ft (_____ m) of cover.
J. Install vent piping penetrating in roofed areas to maintain integrity of roof assembly; refer to roofing specification.
K. Where pipe supports are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
L. Provide support for utility meters in accordance with requirements of utility companies.
M. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
N. Excavate in accordance with Section 31 2316.
O. Install bell and spigot pipe with bell end upstream.
P. Install valves with stems upright or horizontal, not inverted. Refer to Section 22 0523.
Q. Install water piping to ASME B31.9.
R. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
S. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
T. Sleeve pipes passing through partitions, walls and floors.
U. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm).
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
   5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
V. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9.
   2. Support horizontal piping as indicated.
   3. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
   4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
   5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
   8. Provide copper plated hangers and supports for copper piping.
   9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
      a. Painting of interior plumbing systems and components is specified in Section 09 9123.
      b. Painting of exterior plumbing systems and components is specified in Section 09 9113.
   10. Provide hangers adjacent to motor driven equipment with vibration isolation; refer to Section 22 0548.
   11. Support cast iron drainage piping at every joint.

3.04 APPLICATION

A. Use grooved mechanical couplings and fasteners only in accessible locations.
B. Install unions downstream of valves and at equipment or apparatus connections.
C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
D. Install ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
E. Install globe valves for throttling, bypass, or manual flow control services.
F. Provide flow controls in water recirculating systems where indicated.
G. Provide automatic flow control valve where domestic hot water system connects to domestic hot water return system. Locate where accessible for adjustment and servicing. Set thermostatic valves for 121 degree F return temperature.

H. Provide trap-seal primer valves for all floor drains which are not collecting condensate from HVAC equipment and where noted on plan. Install 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.

3.05 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch (10 mm) vertically of location indicated and slope to drain at minimum of 1/4 inch per foot (1:50) slope.

B. Water Piping: Slope at minimum of 1/32 inch per foot (1:400) and arrange to drain at low points.

3.06 TESTING

A. Pressure test piping installations according to code requirements and as follows (most stringent applies).

B. Pressure test all new, altered, extended and repaired supply, storm and sanitary drainage and vent piping.

C. Construct systems with fittings/isolation valves to allow testing of all new work.

D. Rough-in tests shall be performed with water unless manufacturer prescribes alternate method.

E. Notify building inspection official before testing to allow observation / witnessing.

F. Supply rough-in test: Cap all openings and attach pressure gauge near main isolation valve. Slowly open valve filling piping with water to system pressure and vent air from top of system so entire system is filled with water at full pressure. Close isolation valve trapping water in system at pressure without makeup. Videotape entire test procedure and record pressure gauge for an additional 15 minutes showing pressure is maintained.

G. Drain and vent rough-in test: cap all openings and insert a balloon plug within existing piping or main and fill entire system to overflow. If testing is performed in sections, all sections shall include at least a 10' water column except uppermost portion of system (including venting). Videotape top of stack for 15 minutes showing level is maintained.

H. Provide rough-in test report(s) to Engineer and Owner for review and comment before concealment.

I. After fixtures have been installed, operate fixtures with traps filled to confirm no visible leaks.

J. Perform final test: plug stack openings and insert manometer with at least 1" water column of air pressure. Videotape manometer showing level unchanged for at least 15 minutes and showing drop to zero upon removal of pressure.

K. Forward copies of final testing to Engineer and Owner. Maintain records and submit to building official upon request.

L. Include test reports in project closeout submittals provided to owner.

3.07 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect water distribution system in accordance with Section 33 0110.58.

B. Prior to starting work, verify system is complete, flushed and clean.

C. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.

E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
F. Maintain disinfectant in system for 24 hours.
G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.08 SERVICE CONNECTIONS
A. Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.
   1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.

3.09 SUPPORT SCHEDULES
A. Pipe Hanger Spacing:
   1. Metal Piping (and with continuous metal saddle/trough):
      a. Pipe Size: 1/2 inches (15 mm) to 1-1/4 inches (32 mm):
         1) Maximum Hanger Spacing: 6.5 ft (2 m).
         2) Hanger Rod Diameter: 3/8 inches (9 mm).
      b. Pipe Size: 1-1/2 inches (40 mm) to 2 inches (50 mm):
         1) Maximum Hanger Spacing: 10 ft (3 m).
         2) Hanger Rod Diameter: 3/8 inch (9 mm).
      c. Pipe Size: 2-1/2 inches (65 mm) to 3 inches (75 mm):
         1) Maximum Hanger Spacing: 10 ft (3 m).
         2) Hanger Rod Diameter: 1/2 inch (13 mm).
   2. Plastic Piping:
      a. All Sizes:
         1) Maximum Hanger Spacing: 6 ft (1.8 m).
         2) Hanger Rod Diameter: 3/8 inch (9 mm).

END OF SECTION
SECTION 22 1006
PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Drains.
B. Cleanouts.
C. Hose bibbs.
D. Hydrants.
E. Washing machine boxes and valves.
F. Refrigerator valve and recessed box.
G. Backflow preventers.
H. Water hammer arrestors.
I. Sanitary waste interceptors.
J. Mixing valves.

1.02 RELATED REQUIREMENTS

A. Section 22 1005 - Plumbing Piping.
B. Section 22 4000 - Plumbing Fixtures.

1.03 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor and Trench Drains; 2001 (R2007).
B. ASME A112.6.4 - Roof, Deck, and Balcony Drains; 2003.
D. ASSE 1013 - Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers; 2011.
E. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2011.

1.04 SUBMITTALS

A. Refer to Division 01 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
D. Certificates: Certify that all interceptors meet or exceed capacity and flow rate scheduled on plans.
E. Sustainable Design Documentation: Submit appropriate evidence that materials used in potable water systems comply with the specified requirements.
F. Operation Data: Indicate frequency of treatment required for interceptors.
G. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.
H. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors.
I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Refer to Division 01 - Product Requirements, for additional provisions.
   2. Extra Loose Keys for Outside Hose Bibbs: One.
1.05 QUALITY ASSURANCE
   A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in 
      this section with not less than three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING
   A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS
   A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and 
      NSF 372 for maximum lead content.
   B. Unless otherwise noted on plans, provide fixtures as specified below.

2.02 DRAINS
   A. Manufacturers:
      4. Substitutions: Refer to Division 01 - Product Requirements.
   B. Roof Drains:
      1. Assembly: ASME A112.6.4.
      2. Body: Lacquered cast iron with sump.
      3. Strainer: Removable cast aluminum or cast iron dome with vandal proof screws.
      4. Accessories: Coordinate with roofing type, refer to Division 07:
         a. Membrane flange and membrane clamp with integral gravel stop.
         b. Adjustable under deck clamp.
         c. Waterproofing flange.
         d. Controlled flow weir.
         e. Leveling frame.
         f. Adjustable extension sleeve for roof insulation.
         g. Perforated or slotted ballast guard extension for inverted roof.
         h. Perforated stainless steel ballast guard extension.
   C. Roof Overflow Drains:
      1. Lacquered cast iron body and clamp collar and bottom clamp ring; pipe extended to 2 
         inches (_____ mm) above flood elevation.
   D. Downspout Nozzles:
      1. Bronze round with straight bottom section.
   E. Floor Drain (FD-1):
      1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double 
         drainage flange, weep holes, reversible clamping collar, and round, adjustable 
         nickel-bronze strainer.

2.03 CLEANOUTS
   A. Manufacturers:
      1. Substitutions: Refer to Division 01 - Product Requirements.
   B. Cleanouts at Exterior Surfaced Areas (CO-1):
      1. Round cast nickel bronze access frame and non-skid cover.
   C. Cleanouts at Exterior Unsurfaced Areas (CO-2):
      1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.
   D. Cleanouts at Interior Finished Floor Areas (CO-3):
1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

E. Cleanouts at Interior Finished Wall Areas (CO-4):
   1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

F. Cleanouts at Interior Unfinished Accessible Areas (CO-5): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.04 HOSE BIBBS
   A. Manufacturers:
      1. Woodford.
      5. Substitutions: Refer to Division 01 - Product Requirements.
   B. Exterior Hose Bibbs:
      1. ASSE 1019; freeze resistant, self-draining type with chrome plated wall plate, hose thread spout, and integral vacuum breaker.
      2. Provide with key/removeable handle and furnish to owner at substantial completion.
   C. Interior Hose Bibbs:
      1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with handwheel, integral vacuum breaker in conformance with ASSE 1011.

2.05 HYDRANTS
   A. Manufacturers:
      1. Woodford.
      6. Substitutions: Refer to Division 01 - Product Requirements.
   B. Wall Hydrants:
      1. ASSE 1019; freeze resistant, self-draining type with chrome plated wall plate hose thread spout, lockshield and removable key, and integral vacuum breaker.
   C. Roof Hydrants:
      1. ASSE 1019 freeze resistant, self draining type with chrome plated base plate, standpipe hose thread spout, lockshield and removable key, and integral vacuum breaker.

2.06 WASHING MACHINE BOXES AND VALVES
   A. Box Manufacturers:
      3. Substitutions: Refer to Division 01 - Product Requirements.
   B. Description: Preformed rough-in box with brass valves with single lever handle, socket for 2 inch (50 mm) waste, slip in finishing cover.

2.07 REFRIGERATOR VALVE AND RECESSED BOX
   A. Box Manufacturers:
      3. Substitutions: Refer to Division 01 - Product Requirements.
B. Description: Plastic preformed rough-in box with brass valves with wheel handle, slip in finishing cover.

2.08 BACKFLOW PREVENTERS

A. Manufacturers:

B. Reduced Pressure Backflow Preventers:
   1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

2.09 WATER HAMMER ARRESTORS

A. Manufacturers:
   4. Substitutions: Refer to Division 01 - Product Requirements.

B. Water Hammer Arrestors:
   1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F (minus 73 to 149 degrees C) and maximum 250 psi (1700 kPa) working pressure.

2.10 SANITARY WASTE INTERCEPTORS

A. Manufacturers:
   2. Substitutions: Refer to Division 01 - Product Requirements.

B. Grease Interceptors:
   1. Construction:
      b. Rough-in: Fully recessed below grade (deep rough-in), with grade rings and gravel base.
      c. Accessories: Multi-weir baffle assembly, integral deep seal trap, removable integral flow control, sediment bucket.
      d. Cover: Steel, epoxy coated, non-skid with gasket, securing handle, and enzyme injection port, recessed for floor finish.
   2. Unit Rating: gpm flow and lbs grease capacity per plans and local requirements (most stringent).

C. Lint/Sand/Sediment Interceptors:
   1. Epoxy coated cast iron body and secured cover with removable stainless steel sediment bucket.

2.11 MIXING VALVES

A. Thermostatic Mixing Valves:
   1. Manufacturers:
      a. Powers (Digital IntelliStation).
      b. Armstrong (Brain Digital Mixing Station).
      c. Caleffi (6000 Legiomix)
      d. Substitutions: Refer to Division 01 - Product Requirements.
   2. Valve: lead free brass body, stainless steel or copper alloy bellows, integral temperature adjustment.
   3. Accessories:
      a. Check valve on inlets.
b. Volume control shut-off valve on outlet.
c. Stem thermometer on outlet.
d. Strainer stop checks on inlets.

4. Cabinet: 16 gage, 0.0598 inch (1.52 mm) prime coated steel, for recessed mounting with keyed lock.

B. Thermostatic Balance Valves:
   1. Manufacturers:
      b. Substitutions: See Section 01 6000 - Product Requirements.
   2. Valve: Lead free brass body, stainless steel springs and cartridge, integral temperature adjustment from 95 to 140 degrees F with locking adjustment knob.
      a. Capacity: 2 gpm (_____ L/s) flow at 1 psi pressure drop at full open.
      b. Cv: 2.1 maximum, .23 minimum, .52 design.
   3. Accessories:
      a. An integral dry-well holds a slide-in temperature gauge for local indication, or a sensor for remote temperature sensing.
      b. Integral check valve to protect against circuit thermo-syphoning.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that walls and/or floors are prepared and ready for installation.
   B. Confirm that structure is constructed with adequate support.
   C. Confirm connecting pipe size exceeds minimum requirements.

3.02 PREPARATION
   A. Provide additional blocking to structure to prevent movement after construction.
   B. Confirm location and size of openings before rough-in and installation.

3.03 INSTALLATION
   A. Install all work in accordance with manufacturer's instructions.
   B. Install components level and plumb.
   C. Install and secure work in place with flanges, screws, and bolts.
   D. Seal to waterproofing membranes with sealant meeting membrane requirements.
   E. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
   F. Encase exterior cleanouts in concrete flush with grade.
   G. Install floor cleanouts and floor drains at elevation to accommodate finished floor.
   H. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
   I. Pipe relief from backflow preventer to nearest drain.
   J. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to washing machine outlets.

END OF SECTION
SECTION 22 4000
PLUMBING FIXTURES

PART 1  GENERAL
1.01  SECTION INCLUDES
   A. Water closets.
   B. Lavatories.
   C. Sinks.
   D. Service sinks.
   E. Under-lavatory pipe supply covers.
   F. Electric water coolers.
   G. Bathtubs.
   H. Showers.

1.02  RELATED REQUIREMENTS
   A. Section 07 9005 - Joint Sealers: Seal fixtures to walls and floors.

1.03  REFERENCE STANDARDS
   B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011.
   F. ASME A112.18.1 - Plumbing Supply Fittings; 2012.
   G. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2013.
   I. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2004.
   M. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04  SUBMITTALS
   A. Refer to Division 01 - Administrative Requirements, for submittal procedures.
   B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
   C. Samples: Submit two lavatory supply fittings.
   D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
   E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner’s name and registered with manufacturer.
F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Refer to Division 01 - Product Requirements, for additional provisions.
   2. Extra Faucet Washers: One set of each type and size.
   3. Extra Shower Heads: One of each type and size.

1.05 QUALITY ASSURANCE
   A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.06 MOCK-UP
   A. Provide mock-up of typical bathroom group.
   B. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING
   A. Accept fixtures on site in factory packaging. Inspect for damage.
   B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.08 WARRANTY
   A. Refer to Division 01 - Closeout Submittals, for additional warranty requirements.
   B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS
   A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
   B. Water Efficiency: EPA WaterSense label is required for all water closets, urinals, lavatory faucets, and showerheads.

2.02 TANK TYPE WATER CLOSETS
   A. Tank Type Water Closet Manufacturers:
      3. Substitutions: Refer to Division 01 - Product Requirements.
   B. Bowl: ASME A112.19.2; floor mounted, siphon jet, vitreous china, 16.5 inches (420 mm) high, close-coupled closet combination with elongated rim, insulated vitreous china closet tank with fittings and lever flushing valve, bolt caps, vandalproof cover locking device.
   C. Seat Manufacturers:
      5. Substitutions: Refer to Division 01 - Product Requirements.
   D. Seat: Solid white plastic, open front, brass bolts, with cover.
   E. Handle Height: 44 inches (1117 mm) or less.

2.03 LAVATORIES
   A. Lavatory Manufacturers:
      1. Substitutions: Refer to Division 01 - Product Requirements.
   B. Vitreous China Counter Top Basin: ASME A112.19.2; vitreous china self-rimming counter top lavatory, with drillings to match faucet, front overflow, soap depression, seal with concealed vinyl gasket and caulk.
C. Vitreous China Under-Mount Basin: ASME A112.19.2; vitreous china under-mount lavatory, front overflow, mounting kit and template by manufacturer.

D. Supply Faucet Manufacturers:
   3. Substitutions: Refer to Division 01 - Product Requirements.

2.04 SINKS
A. Single Compartment Bowl: ASME A112.19.3;
   1. 20 gage, 0.0359 inch thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
   2. Drain: 3-1/2 inch (90 mm) crumb cup and tailpiece.

2.05 UNDER-LAVATORY PIPE SUPPLY COVERS
A. General:
   1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
   2. Construction: 1/8 inch (3.2 mm) PVC with antimicrobial, antifungal and UV resistant properties.
      a. Comply with ASME A112.18.9 for covers on accessible lavatory piping.

2.06 SHOWER RECEPTORS
A. Solid Surfacing Shower Receptors: Solid plastic resin casting, self-supporting, for installation over conventional subfloor; complying with ANSI Z124.1.2.
   1. Material: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, renewable material filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
   2. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 450 or less, Class A, when tested in accordance with ASTM E84.
   3. Finish on Exposed Surfaces: Provide satin or matte, gloss rating of 3 to 20.

B. Drain Trim: Removable chrome plated strainer and tail piece.

2.07 SHOWERS
A. Hand-Held Shower Head:
   1. ASME A112.18.1, adjustable spray hand-held shower head with swivel fitting, with ASSE 1014 backflow preventer.
   2. Provide pushbutton flow control.
   3. Include 60 inch (1525 mm) minimum flexible polished stainless steel hose and in-line vacuum breaker.
   4. Provide 25 inch (635 mm) grab bar with sliding spray holder that locks at any height, allowing use of unit as either a hand-held spray or a fixed shower head.

2.08 ELECTRIC WATER COOLERS
A. Electric Water Cooler Manufacturers:
   1. Sunroc Division of Oasis: http://www.sunroccoolers.com
   4. Oasis, a Lynn Tilton Company:  www.oasiscoolers.com
   5. Substitutions: Refer to Division 01 - Product Requirements.

B. Water Cooler: Electric, mechanically refrigerated; surface handicapped mounted; stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.
1. Capacity: 8 gallons per hour (30.3 liters per hour) of 50 degrees F (10 degrees C) water with inlet at 80 degrees F (27 degrees C) and room temperature of 90 degrees F (32 degrees C), when tested in accordance with ASHRAE Std 18.

2. Electrical: 115 V, 60 Hertz compressor, 6 foot (2 m) cord and plug for connection to electric wiring system including grounding connector.

2.09 SERVICE SINKS

A. Service Sink Manufacturers:
   2. Fiat: www.fiat.com
   3. Substitutions: Refer to Division 01 - Product Requirements.

B. Bowl: 36 by 24 by 10 inch (900 by 600 by 250 mm) high white molded stone, floor mounted, with one inch (25 mm) wide shoulders, vinyl bumper guard, stainless steel strainer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports and bolts.

E. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 9005, color to match fixture.

F. Provide two (2) sinks, faucets, and water closets of each type provided for attic stock.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.05 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.06 CLEANING

A. Clean plumbing fixtures and equipment before substantial completion.

3.07 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Do not permit use of fixtures by construction personnel.

C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION
SECTION 23 0050
HVAC EXECUTION

PART 1 GENERAL

1.01 SUMMARY
A. This Section includes:
   1. Definitions.
   2. Coordination.
   3. Dielectric fittings.
   4. Mechanical sleeve seals.
   5. Sleeves.
   7. Grout.
   8. HVAC demolition.
   9. Equipment installation requirements common to equipment sections.
   10. Supports and anchorages.

1.02 RELATED DOCUMENTS
A. Drawings, General Provisions of the Contract, including General Conditions, Supplementary General Conditions, other Division 00 & 01 Specification Sections, shall apply to this division.
B. These requirements apply to all Division 23 work.

1.03 DEFINITIONS
A. "Approved" means approved by the Engineer and Owner.
B. "Furnish" means to purchase, arrange for delivery to site, and to take delivery at the site.
C. "Install" means to place in position for use.
D. "Provide" means to furnish and install.
E. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
F. 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.
G. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
H. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
I. 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.

1.04 COORDINATION
A. Coordination: Coordinate construction operations to ensure efficient and orderly installation of the Work.
   1. Coordinate construction operations, which depend on each other for proper installation, connection, and operation.
   2. 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.
   3. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
   4. Make adequate provisions to accommodate items scheduled for later installation.
5. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components.

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 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 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. Pre-installation conferences.
   7. Project closeout activities.
   8. Startup and adjustment of systems.
   9. Project closeout activities.

1.05 PROJECT MEETINGS

A. General: Attend meetings and conferences at Project site, unless otherwise indicated.
   1. Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Engineer of scheduled meeting dates and times.
   2. Agenda: Request the meeting agenda if not furnished prior to meeting.
   3. Minutes: Record significant discussions and agreements achieved. Request the meeting minutes if not furnished. Note all discrepancies and notify Engineer of all changes to the Work or to the Contract Documents.

B. Preconstruction Conference: Attend the preconstruction conference before starting construction, no later than 15 days after execution of the Agreement to review responsibilities and personnel assignments.
   1. Attendees: Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   2. Agenda: Discuss items of significance that could affect progress, including the following as applicable:
      a. Tentative construction schedule.
      b. Phasing.
      c. Critical work sequencing and long-lead items.
      d. Designation of key personnel and their duties.
      e. Procedures for processing field decisions and Change Orders.
      f. Procedures for requests for interpretations (RFIs).
      g. Procedures for testing and inspecting.
      h. Procedures for processing Applications for Payment.
      i. Distribution of the Contract Documents.
      j. Submittal procedures.
      k. LEED requirements.
      l. Preparation of Record Documents.
      m. Use of the premises.
      n. Work restrictions.
      o. Owner's occupancy requirements.
      p. Responsibility for temporary facilities and controls.
q. Construction waste management and recycling.
r. Parking availability.
s. Office, work, and storage areas.
t. Equipment deliveries and priorities.
u. First aid.
w. Progress cleaning.
x. Working hours.

C. Pre-installation Conferences: Attend a pre-installation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following as applicable:
   b. Options.
   c. Related requests for interpretations (RFIs).
   d. Related Change Orders.
   e. Purchases, deliveries, submittals.
   f. Review of mockups.
   g. Possible conflicts.
   h. Compatibility problems.
   i. Time schedules.
   j. Weather limitations.
   k. Manufacturer's written recommendations.
   l. Warranty requirements.
   m. Compatibility of materials.
   n. Acceptability of substrates.
   o. Space and access limitations.
   p. Regulations of authorities having jurisdiction.
   q. Testing and inspecting requirements.
   r. Installation procedures.
   s. Coordination with other work.
   t. Required performance results.
   u. Protection of adjacent work.
   v. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present, to parties who should have been present, and to the Engineer.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

1.06 SUBMITTALS
A. Alternate Products: Alternate manufacturers, equipment and /or products must be specified or approved prior to bid in writing via addendum to be accepted. All costs associated with deviations from the basis of design shall be borne by the contractor. Deviations shall include alternate manufacturer and/or alternate product and shall include all significant dimensional, performance, electrical, or installation differences from the basis of design products. Costs for reimbursement shall include the costs of other trades affected, and shall include all engineering costs to evaluate such deviations.
B. Substitutions: Unspecified manufacturers shall be considered substitutions and shall be submitted for consideration under the specified substitution procedures. Substitutions shall be submitted to the engineer for evaluation. If approved by the engineer, substitution shall be offered to the owner for consideration. All costs associated with substitutions shall be borne by the contractor. Costs for reimbursement shall include the costs of other trades affected, and shall include all engineering costs to evaluate such deviations.

C. Coordination Drawings: Prepare Coordination Drawings (coordinated shop drawings), scaled at not less than 3/8"=1'-0", to coordinate and maximize utilization of space for efficient installation of different components and for installation of products and materials fabricated by separate entities. Submit to Engineer for review before starting work.
   1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
      a. Indicate functional and spatial relationships of components of the work with all other systems and trades.
      b. Indicate required installation sequences.
      c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide sketches of proposed alternate construction to Engineer for resolution of such conflicts. Dimension changes and difficult installations will not be considered changes to the Contract.

D. 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 and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project. Submit to Engineer before starting work.
   1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

E. Make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements. If equipment is submitted which differs in arrangement from that shown, provide drawings that show the rearrangement of all associated systems. Approval will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract.

F. Prior to submitting shop drawings for review, contractor shall certify in writing that manufacturers of all major items of equipment have each reviewed drawings and specifications, and have jointly coordinated and properly integrated their equipment and controls to provide a complete and efficient installation.

G. Welding certificates.

1.07 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 at contractor’s cost. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.
1.08 Warranties
A. All work shall include a parts and labor warranty on materials and workmanship for a period of 1 year. In addition to standard manufacturer product warranties, all equipment shall include a warranty on compressors and heat exchangers for a period of 10 years.
B. Refer to Division 01 for additional warranty requirements.

PART 2 PRODUCTS

2.01 Sleeves
A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop.
C. Sleeves for Rectangular Openings: Galvanized sheet steel.
   1. Minimum Metal Thickness:
      a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
      b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).
D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.02 Grout
A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
   2. Design Mix: 5000-psi, 28-day compressive strength.

2.03 Mechanical Sleeve Seals
A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
   1. Sealing Elements: EPDM-rubber or NBR 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.
   3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements.

2.04 Escutcheons/Trim Rings
A. Description: Manufactured wall and ceiling escutcheons, floor plates, and duct trim rings, with an ID to closely fit around pipe/duct/insulation surface and with an OD that completely covers opening.
B. One-Piece, deep-drawn or cast metal with polished chrome plated finish and set screw.
C. Split, cast metal with concealed hinge polished chrome plated finish and set screw.
D. Rectangular trim rings shall be formed metal with mitered corners.

PART 3 EXECUTION

3.01 HVAC Demolition
A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.
B. Contractor shall be responsible for all work and costs associated with demolition shown or noted on plans.
C. Verify exact requirements before bid and include direct and related indirect costs in estimate including permit application, fees, dust control, protection of existing, temporary HVAC, fuel usage, scaffolding, disconnection, disposal, cutting and patching.

D. Occupied Buildings: For occupied buildings, coordinate with local management for communication with building users, occupants, and/or residents regarding potential for disruption, and provide 72 hour advance notification for planned outages. Install new work to the fullest extent possible before interrupting existing services to minimize disruption to residents. Provide temporary heat/cooling equipment for disruptions lasting over 4 hours.

E. In performing the work:
   1. Coordinate with existing conditions and other trades before starting work.
   2. Remove portions of walls, floors, ceilings, etc. required for access to demolished and new work.
   3. Disconnect, demolish, and remove systems, equipment, and components indicated to be removed.
   4. Piping to Be Removed: Remove portion indicated to be removed and cap or plug remaining with same or compatible piping material.
   5. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
   6. Ducts to Be Removed: Remove portion of ducts indicated to be removed and cap remaining ducts with same or compatible duct material.
   7. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
   8. Equipment to Be Removed: Arrange for disconnection of electrical power. Disconnect and cap services and remove equipment. Remove related supports, anchorages, and concrete bases.
   9. Equipment to Be Removed and Reinstalled: Arrange for disconnection of electrical power. Disconnect and cap services and remove, clean, and store equipment. When appropriate, reinstall, reconnect, arrange for power connection and make equipment operational.
   10. Equipment to Be Removed and Salvaged: Arrange for disconnection of electrical power. Disconnect and cap services, remove equipment and deliver to Owner.

F. If new or existing to remain products are damaged during demolition, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

G. Subcontract the General Contractor to perform patching, repair or replacement of walls floors, ceilings, etc. removed for access to the work. General contractor shall repair finishes to match surrounding finishes.

3.02 PENETRATIONS

A. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls. Sleeve ends shall be flush with both wall surfaces unless otherwise noted. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Concrete and masonry penetrations: seal space outside of sleeves with grout. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

B. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."

C. Roof-Penetrations: Seal penetration of roof with flexible boot-type flashing units applied in coordination with roofing work.

D. Aboveground, Exterior-Wall Penetrations: Position pipe in center of sleeve. Maintain 1% outward slope, unless otherwise indicated. Seal penetrations using non-expanding foam. After cured, trim flush with sleeve end and paint with color to match surrounding finish.
E. 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.

F. Rated Assembly Penetrations: Maintain indicated fire and smoke ratings of walls, partitions, ceilings, and floors. Coordinate selection and application of firestopping specified in Division 07. Comply with requirements in Division 07.

G. For ducted penetrations of fire and/or smoke rated assemblies, provide dampers to maintain fire and/or smoke rating. Provide dynamically rated fire dampers for penetrations of wall and noncombustible floor assemblies. Provide combination fire and smoke dampers for corridors and other fire/smoke rated assemblies. Provide ceiling radiation dampers for combustible floor/ceiling assemblies with interlock to shut down fan. Fire and smoke damper products and execution requirements are specified elsewhere in Division 23.

H. For non-ducted penetrations of fire and/or smoke rated floor and wall assemblies, apply firestopping to restore original fire-resistance rating of assembly. Firestopping shall comply with listing of rated assembly. Firestopping materials and installation requirements are specified in Division 07.

I. Penetrations of membranes shall be protected by UL listed products. Coordinate exact installation conditions with selected fire sealants supplier. For penetrations which do not have a standard UL installation detail, arrange for engineering determination from manufacturer and/or sealant supplier, furnish details to inspecting authority and provide products and execution to match listing details.

3.03 INSTALLATION - COMMON REQUIREMENTS

A. Install equipment, devices, and specialties according to manufacturer installation instructions and recommendations.

B. Refer to other Sections of these Specifications for additional requirements.

C. Install to allow maximum possible headroom unless specific mounting heights are indicated. Provide warning markers for all work below 7'-6" above walking surface.

D. Install work level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

E. Install work to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

F. Install work to allow right of way for piping with required slope.

G. Contact equipment manufacturer's representative to visit site and observe installation in order to confirm installation requirements and warranty coverage. Document observation in writing and include in O&M manuals.

H. Provide service and maintenance for not less than one year from the Date of Substantial Completion or for the warranty period specified in Division 01, whichever is longer. Refer to Division 01 for additional service and requirements.

3.04 SUPPORTS AND ANCHORAGES

A. Provide supports to match construction type and adjacent assembly rating.

B. For combustible construction, provide wood supports and anchorages. Cut, fit, and place nailers, blocking, and anchorages to support, and anchor materials and equipment. 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. For non-combustible building construction provide metal supports and anchorages. Refer to Division 05 Section "Metal Fabrications" for structural steel. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment. Field Welding shall comply with AWS D1.1.
D. Attach to substrates as required to support applied loads.

3.05 GROUTING
A. Clean surfaces that will come into contact with grout. Provide forms as required for placement of grout.
B. Mix and install grout for HVAC equipment base bearing surfaces, and anchors.
C. Place grout around anchors and completely filling equipment base and provide smooth bearing surface for equipment. Avoid air entrapment during placement of grout.
D. Allow grout to cure before loading or applying forces.

3.06 SLEEVE-SEAL INSTALLATION
A. Use 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 pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION
SECTION 23 0513
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES
A. General construction and requirements.
B. Applications.
C. Single phase electric motors.

1.02 REFERENCE STANDARDS
A. NEMA MG 1 - Motors and Generators; 2014.
B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS
A. Refer to Division 01 - Administrative Requirements for submittal procedures.
B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
C. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.
D. Operation Data: Include instructions for safe operating procedures.
E. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.04 QUALITY ASSURANCE
A. Conform to NFPA 70.
B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.05 DELIVERY, STORAGE, AND HANDLING
A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

PART 2 PRODUCTS

2.01 GENERAL CONSTRUCTION AND REQUIREMENTS
A. Construction:
   1. Open drip-proof type except where specifically noted otherwise.
   2. Design for continuous operation in 104 degrees F (40 degrees C) environment.
   3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
B. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.
C. Wiring Terminations:
   1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
   2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.02 APPLICATIONS
A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not conform to these specifications.
B. Single phase motors for shaft mounted fans, oil burners, and centrifugal pumps: Split phase type.
C. Single phase motors for shaft mounted fans or blowers: Permanent split capacitor type.
D. Single phase motors for fans, pumps, blowers, and air compressors: Capacitor start type.
E. Single phase motors for fans, blowers, and pumps: Capacitor start, capacitor run type.

2.03 SINGLE PHASE POWER - SPLIT PHASE MOTORS
A. Starting Torque: Less than 150 percent of full load torque.
B. Starting Current: Up to seven times full load current.
C. Breakdown Torque: Approximately 200 percent of full load torque.

2.04 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS
A. Starting Torque: Exceeding one fourth of full load torque.
B. Starting Current: Up to six times full load current.
C. Multiple Speed: Through tapped windings.
D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

2.05 SINGLE PHASE POWER - CAPACITOR START MOTORS
A. Starting Torque: Three times full load torque.
B. Starting Current: Less than five times full load current.
C. Pull-up Torque: Up to 350 percent of full load torque.
D. Breakdown Torque: Approximately 250 percent of full load torque.

END OF SECTION
SECTION 23 0548
VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Vibration isolation requirements.
B. Vibration isolators.

1.02 RELATED REQUIREMENTS
A. Refer to Division 01 - Code-Required Special Inspections.
B. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Notify Architect & Building Systems Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.05 SUBMITTALS
A. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
   1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification method for spring element load capacities.
B. Shop Drawings - Vibration Isolation Systems:
   1. Include dimensioned plan views and sections indicating proposed arrangement of vibration isolators; indicate equipment weights and static deflections.
C. Manufacturer’s detailed field testing and inspection procedures.
D. Refer to Division 01 - Administrative Requirements, for submittal procedures.
E. Shop Drawings:
   1. Include delegated design calculations that indicate compliance with the applicable building code, and the vibration isolator manufacturer's recommendations.

1.06 QUALITY ASSURANCE
A. Comply with applicable building code.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
C. Perform delegated design and installation in accordance with applicable codes.
PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing HVAC equipment and/or HVAC connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:
   1. Select vibration isolators to provide required static deflection.
   2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
   3. Select vibration isolators for outdoor equipment to comply with wind design requirements.
   4. Select vibration-isolated equipment support bases and associated vibration isolators to provide minimum 2 inch (50 mm) operating clearance beneath base unless otherwise indicated.

D. Equipment Isolation: As indicated on drawings and as scheduled in ASRAE Handbook (2015 Applications Chapt. 48) based on equipment, application and structure.

2.02 PERFORMANCE REQUIREMENTS

A. General:
   1. All equipment mounted on vibration isolated bases to have minimum operating clearance of 2 inches (50 mm) between the base and floor or support beneath unless noted otherwise.

2.03 VIBRATION ISOLATORS

A. Manufacturers:
   1. Vibration Isolators:
      d. Substitutions: See Section 01 6000 - Product Requirements.

B. General Requirements:
   1. Spring Elements for Spring Isolators:
      a. Color code or otherwise identify springs to indicate load capacity.
      b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
      c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
      d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
      e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
      f. Selected to function without undue stress or overloading.

C. Vibration Isolators for Non-Seismic Applications:
   1. Restrained Spring Isolators, Non-Seismic:
      a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop.
      b. Bottom Load Plate: Steel with non-skid elastomeric isolator pad with provisions for bolting to supporting structure as required.
      c. Furnished with integral leveling device for positioning and securing supported equipment.
d. Provides constant free and operating height.

D. Non-Seismic Type:
   1. Spring Hanger:
      a. Housing: Steel construction containing stable steel spring and integral glass fiber or
         elastomeric element preventing metal to metal contact.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Coordinate proposed equipment locations with structural shop drawings and structure before
      ordering equipment.
   B. Verify structure with field measurements before placing equipment supports.
   C. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control
      components and associated attachments.
   D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION
   A. Install products in accordance with manufacturer's instructions.
   B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES)
      evaluation report conditions of use where applicable.
   C. Secure fasteners according to manufacturer's recommended torque settings.
   D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic
      relative displacements as indicated or as required.
   E. Vibration Isolation Systems:
      1. Spring Isolators:
         a. Position equipment at operating height; provide temporary blocking as required.
         b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to
            isolators.
         c. Level equipment by adjusting isolators gradually in sequence to raise equipment
            uniformly such that excessive weight or stress is not placed on any single isolator.
      2. Clean debris from beneath vibration-isolated equipment that could cause short circuiting of
         isolation.
      3. Use elastomeric grommets for attachments where required to prevent short circuiting of
         isolation.
      4. Adjust isolators to be free of isolation short circuits during normal operation.
      5. Do not overtighten fasteners such that resilient material isolator pads are compressed
         beyond manufacturer's maximum recommended deflection.

3.03 FIELD QUALITY CONTROL
   A. Provide services of a manufacturer's authorized representative for vibration isolation systems to
      observe installation and assist in inspection and testing. Include manufacturer's detailed testing
      and inspection procedures and field reports with submittals.
   B. Vibration Isolation Systems:
      1. Verify isolator static deflections.
      2. Verify vibration isolation performance during normal operation; investigate sources of
         isolation short circuits.
   C. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control
      components.
   D. Refer to Division 01 - Quality Requirements, for additional requirements.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
A. Nameplates.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS
A. Refer to Division 01 - Administrative Requirements for submittal procedures.
B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
C. Schedule: Submit schedules of equipment and valves including tag, location, function, and manufacturer's name and model number.
D. Product Data: Provide manufacturers catalog literature for each product required.
E. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
F. Project Record Documents: Record locations of equipment, dampers and valves.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS
A. Air Handling Units: Nameplates.
B. Condensing Units: Nameplates.

2.02 NAMEPLATES
A. Manufacturers:
   2. Letter Height: 1/4 inch (6 mm).

PART 3 EXECUTION

3.01 PREPARATION
A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION
A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
B. Install in accordance with manufacturer's instructions.
C. Use tags on piping 3/4 inch (20 mm) diameter and smaller.
   1. Identify service, flow direction, and pressure.

END OF SECTION
SECTION 23 2300
REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping.
B. Refrigerant.
C. Moisture and liquid indicators.
D. Valves.
E. Filter-driers.
F. Engineered wall seals and insulation protection.

1.02 REFERENCE STANDARDS

A. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.
C. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2013.
N. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011-AMD 1.

1.03 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.
C. Liquid Indicators.
D. Valves.
   1. Use service valves on suction and discharge of compressors.
   2. Use gauge taps at compressor inlet and outlet.
E. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.
F. Filter-Driers:
   1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

1.04 SUBMITTALS
   A. Refer to Division 01 - Administrative Requirements, for submittal procedures.
   B. Product Data: Provide general assembly of specialties, including manufacturers catalogue information. Provide manufacturers catalog data including load capacity.
   C. Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.

1.05 DELIVERY, STORAGE, AND HANDLING
   A. Deliver and store piping and specialties in shipping containers with labeling in place.
   B. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.
   C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.01 PIPING
   A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
      2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.
   B. Copper Tube to 7/8 inch (22 mm) OD: ASTM B88 (ASTM B88M), Type K (A), annealed.

2.02 MOISTURE AND LIQUID INDICATORS
   A. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F (93 degrees C) and maximum working pressure of 500 psi (3450 kPa).

2.03 VALVES
   A. Service Valves:
      1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psi (3450 kPa).

2.04 FILTER-DRIERS
   A. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.
   B. Construction: UL listed.
      1. Connections: As specified for applicable pipe type.

2.05 FLEXIBLE ELASTOMERIC CELLULAR INSULATION
   A. Manufacturer:
      1. Standard products furnished by tubing manufacturer..
   B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
      1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
      4. K value: < .245 BTU-in./(h-SF-deg.F) per ASTM C177
5. Permeability: < .01 perm-in.

2.06 ENGINEERED WALL SEALS AND INSULATION PROTECTION

A. Manufacturers:
   2. Substitutions: Refer to Division 01 - Product Requirements.

B. Pipe Penetration Wall Seal: Seals HVAC piping wall penetrations with compression gasket wall mounted rigid plastic outlet cover.
   1. Outlet Cover Color: Selected by architect.
   2. Water Penetration: Comply with ASTM E331.
   3. Air Leakage: Comply with ASTM E283.

C. Insulation Protection System: Mechanical line insulation and PVC cover.
   1. PVC Insulation Cover Color: Black with full-length velcro fastener.
   3. Water/Vapor Permeability: Comply with ASTM E96/E96M.
   6. Adhesive free.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Install refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

E. Pipe Hangers and Supports.

F. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.

G. Provide access to concealed valves and fittings. Coordinate size and location of access doors with Section 08 3100.

H. Flood piping system with nitrogen when brazing.

I. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.

J. Insulate piping; refer to Section and Section 22 0716.

K. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.

L. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.

3.03 FIELD QUALITY CONTROL

A. Refer to Division 01 - Quality Requirements, for additional requirements.

B. Test refrigeration system in accordance with ASME B31.5.
C. Pressure test system with dry nitrogen to 200 psi (1380 kPa). Perform final tests at 27 inches (92 kPa) vacuum and 200 psi (1380 kPa) using halide torch. Test to no leakage.

3.04 SCHEDULES

A. Hanger Spacing for Copper Tubing.
   1. 1/2 inch (13 mm), 5/8 inch (16 mm), and 7/8 inch (22 mm) OD: Maximum span, 5 feet (1500 mm); minimum rod size, 1/4 inch (6.3 mm).
   2. 1-1/8 inch (29 mm) OD: Maximum span, 6 feet (1800 mm); minimum rod size, 1/4 inch (6.3 mm).

END OF SECTION
SECTION 23 3423
HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ceiling exhaust fans (Energy Star)

1.02 REFERENCE STANDARDS

B. AMCA Compliance: Products shall comply with air and sound performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.
C. NEMA MG 1 - Motors and Generators; 2014.
D. UL 705 - Power Ventilators; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. B.
   Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.
C. Manufacturer's Instructions: Indicate installation instructions.
D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project and attic stock.
   1. Refer to Division 01 - Product Requirements, for additional provisions.
   2. Dwelling Unit Bathroom Exhaust Fans: Provide two extra bathroom exhaust fans.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.05 FIELD CONDITIONS

A. Permanent ventilators may not be used for ventilation during construction.

PART 2 PRODUCTS

2.01 POWER VENTILATORS - GENERAL

A. Static and Dynamically Balanced: HVI certification.
B. Performance Ratings: Determined in accordance with HVI certification.
C. Sound Ratings: Tested to HVI certification.
D. Fabrication: Conform to AMCA 99.
E. Fabrication: Conform to HVI.
F. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.02 CEILING EXHAUST FANS (ENERGY STAR LABELED)

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on equipment schedule or a comparable product by one of the following:
   1. Broan.
   2. Greenheck Fan Corporation.
   3. Loren Cook.
   5. Panasonic.
B. Description: Energy Star Rated, centrifugal fans designed for installing in ceiling or wall for concealed applications.
C. Housing: Steel lined with acoustical insulation.
D. Fan Wheel: Centrifugal wheel directly mounted on motor shaft. Fan shrouds, motor and fan wheel shall be removable for service.
E. Grille: Painted aluminum, louvered grille with flange on intake and thumbscrew attachment to fan housing.
F. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

PART 3 EXECUTION

3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions.
B. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

END OF SECTION
SECTION 23 5100
BREECHINGS, CHIMNEYS, AND STACKS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Type B double wall gas vents.
B. Single wall metal stacks.
C. Double wall metal stacks.

1.02 REFERENCE STANDARDS
D. UL 103 - Factory-Built Chimneys for Residential Type and Building Heating Appliances; Current Edition, Including All Revisions.

1.03 DEFINITIONS
A. Breeching: Vent Connector.
B. Vent: That portion of a venting system designed to convey flue gases directly outdoors from a vent connector or from an appliance when a vent connector is not used.
C. Vent Connector: That part of a venting system that conducts the flue gases from the flue collar of an appliance to a chimney or vent, and may include a draft control device.

1.04 DESIGN REQUIREMENTS
A. Factory built vents and chimneys used for venting natural draft appliances shall comply with NFPA 211 and be UL listed and labeled.

1.05 ADMINISTRATIVE REQUIREMENTS
A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.06 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data indicating factory built chimneys, including dimensional details of components and flue caps, dimensions and weights, electrical characteristics and connection requirements.
C. Shop Drawings: Indicate general construction, dimensions, weights, support and layout of breechings. Submit layout drawings indicating plan view and elevations where factory built units are used.
D. Manufacturer's Instructions: Include installation instructions, and indicate assembly, support details, and connection requirements.
E. Manufacturer's Certificate: Certify that refractory lined metal stacks meet or exceed specified requirements.
F. Designer's Qualification Statement.
G. Manufacturer's Qualification Statement.
H. Installer's Qualification Statement.
1.07 QUALITY ASSURANCE
   A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
   B. Installer Qualifications: Company specializing in performing the type of work specified in this section with minimum ________ years documented experience, and approved by manufacturer.

PART 2 PRODUCTS
2.01 MANUFACTURERS
   A. DuraVent: www.duravent.com/#sle.
   B. Metal-Fab, Inc: www.mtfab.com/#sle.

2.02 BREECHINGS, CHIMNEYS, AND STACKS - GENERAL REQUIREMENTS
   A. Regulatory Requirements:
      1. Conform to applicable code for installation of natural gas burning appliances and equipment.

2.03 TYPE B DOUBLE WALL GAS VENTS
   A. Fabrication: Inner pipe of sheet aluminum, and outer pipe of galvanized sheet steel, tested in compliance with UL 441.
   B. Electrically Actuated Vent Dampers: Same size as draft hood collar, constructed of stainless steel or galvanized steel, with corrosion-resistant components, in compliance with ANSI Z21.66.

2.04 SINGLE WALL METAL STACKS
   A. Manufacturers:
      2. Selkirk Corporation.
      3. Metal-Fab.
      4. DuraVent
   B. Provide single wall metal stacks, tested to UL 103 and UL listed with positive pressure rating, for use with building heating equipment, in compliance with NFPA 211.
   C. Fabricate with AL29-4C stainless steel.
      1. Protect aluminized steel surfaces exposed to the elements with a minimum of one base coat of primer and one finish coat of corrosion resistant paint suitable for outer jacket skin temperatures of the application.

2.05 DOUBLE WALL METAL STACKS
   A. Provide double wall metal stacks, tested to UL 103 and UL listed with positive pressure rating, for use with building heating equipment, in compliance with NFPA 211.
   B. Fabricate with 1 inch (25 mm) minimum air space between walls and construct inner liner of 304 stainless steel and outer jacket of AL29-4C stainless steel.
      1. Protect aluminized steel surfaces exposed to the elements with a minimum of one base coat of primer and one finish coat of corrosion resistant paint suitable for outer jacket skin temperatures of the application.

PART 3 EXECUTION
3.01 INSTALLATION
   A. Install in accordance with manufacturer's instructions.
   B. For Type B double wall gas vents, maintain UL listed minimum clearances from combustibles. Assemble pipe and accessories as required for complete installation.
C. Assemble and install stack sections in accordance with NFPA 82, industry practices, and in compliance with UL listing. Join sections with acid-resistant joint cement. Connect base section to foundation using anchor lugs.

D. Level and plumb chimney and stacks.

3.02 SCHEDULES

A. Breechings, Chimneys and Stacks.
   1. Water Heater: Galvanized breeching, Type B chimney.

END OF SECTION
SECTION 23 8126.13
SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Air-source heat pumps.
   B. Air cooled condensing units.
   C. Indoor ductless fan & coil units.
   D. Controls.

1.02 REFERENCE STANDARDS
   A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source
      Heat Pump Equipment; 2008, Including All Addenda.
   B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.
   D. ASHRAE Std 23.1 - Methods of Testing for Rating the Performance of Positive Displacement
      Refrigerant Compressors and Condensing Units that Operate at Subcritical Temperatures of the
      Refrigerant; 2010.
   E. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical;

1.03 SUBMITTALS
   A. Refer to Division 01 - Administrative Requirements, for submittal procedures.
   B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and
      wiring diagrams. Include equipment served by condensing units in submittal, or submit at same
      time, to ensure capacities are complementary.
   C. Shop Drawings: Provide plans with routing coordinated through walls and structure. Indicate
      assembly, required clearances, and location and size of field connections.
   D. Design Data: Indicate refrigerant pipe sizing.
   E. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions. Provide
      manufacturer's approved refrigerant piping schematics indicating refrigerant pipe sizes for
      lengths to be installed; riser isometric diagrams; double risers or traps for oil management if
      required.
   F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating
      instructions, installation instructions, maintenance and repair data, and parts listing.
   G. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's
      name and registered with manufacturer.

1.04 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. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems
      and Equipment" and Section 7 - "Construction and Startup."
   C. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA
      90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.05 WARRANTY
   A. Refer to Division 01 - Closeout Submittals, for additional warranty requirements.
B. Special Warranty: Manufacturer's standard form on all parts for a period of 1 year from date of installation. The compressor shall have a warranty of 6 years from the date of the original installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on equipment schedule or comparable product by one of the following.
1. Mitsubishi.
2. Fujitsu.
3. Panasonic.

2.02 SYSTEM DESIGN

A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
1. Heating and Cooling: Air-source electric heat pump located in outdoor unit with evaporator; auxiliary electric heat.
2. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.

B. Performance Requirements: See Drawings for additional requirements.

2.03 INDOOR UNITS FOR DUCTLESS SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.
1. Location: High-wall.
2. Cabinet: Galvanized steel.

B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.

C. Remote Actuators.

2.04 OUTDOOR UNITS

A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
1. Comply with AHRI 210/240.
2. Refrigerant: R-410A.
3. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23.1 and UL 207.

B. Compressor: AHRI 520; hermetic, variable speed inverter type, resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.

C. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.

D. Coil: Air-cooled, aluminum fins bonded to copper tubes.
E. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).
   1. Provide thermostatic expansion valves.
   2. Provide heat pump reversing valves.

F. Operating Controls:
   1. Control by room thermostat to maintain room temperature setting.
   2. Low Ambient Kit: Provide refrigerant pressure switch to cycle condenser fan on when condenser refrigerant pressure is above 285 psig (1965 kPa) and off when pressure drops below 140 psig (965 kPa) for operation to 0 degrees F (-18 degrees C).

G. Mounting Pad: Poured concrete pad, minimum 4 inches (100 mm) thick and extend at least 4 inches beyond unit.

2.05 ACCESSORY EQUIPMENT

A. Room Thermostat: Wall-mounted, large easy to read digital display, electric solid state microcomputer based room thermostat with remote sensor to maintain temperature setting; low-voltage; with following features:
   1. System selector switch (heat-off-cool) and fan control switch (auto-on).
   2. Automatic switching from heating to cooling.
   3. Preferential rate control to minimize overshoot and deviation from setpoint.
   4. Programming based on weekdays, Saturday and Sunday.
   5. Thermostat Display:
      a. Time of day.
      b. Actual room temperature.
      c. Programmed temperature.
      d. Day of week.
      e. System Mode Indication: Heating, Cooling, Fan Auto, Off, and On, Auto or On, Off.
   6. Smart capabilities:
      a. Connect to the internet using wi-fi for remote control from a smart phone.
      b. Self adjust using learning technologies, resident patterns and ambient conditions.
      c. Provide resident access to energy consumption reports.

G. Manufacturers:
   a. Mitsubishi.
   b. Fujitsu.
   c. Panasonic.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available and in correct location.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Install refrigeration systems in accordance with ASHRAE Std 15 and manufacturer installation instructions and recommendations.

C. Have manufacturer's local representative verify installation and accessories are correct and match manufacturer requirements. Document the inspection and signoff and include in Owner and Maintenance manual.

D. Pipe drain from condensate outlet to nearest floor drain.

END OF SECTION
SECTION 23 8200
CONVECTION HEATING AND COOLING UNITS

PART 1 GENERAL
1.01 SECTION INCLUDES
A. Electric baseboard.
B. Electric unit heaters.
C. Electric wall heaters.

1.02 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. 
C. Product Data: Provide typical catalog of information including arrangements.
D. Shop Drawings:
   1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.
   2. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.
   3. Indicate mechanical and electrical service locations and requirements.
E. Manufacturer's Instructions: Indicate installation instructions and recommendations.
F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.
G. Warranty: Submit manufacturer's warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

1.03 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.04 WARRANTY
A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS
2.01 ELECTRIC BASEBOARD
A. Manufacturers: Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on equipment schedule or a comparable product by one of the following:
   1. Chromalox, Inc.
   2. Indeeco.
   3. Markel.
   4. Q-Mark.
B. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for the purpose indicated.
C. Assembly: Suitable for flush mounting on any floor surface with built-in controls, wire raceway, thermal safety cut-out, and electric terminal box.
D. Heating Elements:
   1. Enclosed nickel chromium wire in steel sheathing or tubing.
   2. Mechanically bonded, aluminum finned, heating elements.
   3. Heating element securely anchored and free-floating for noise free operation.
E. Enclosure:
1. Minimum 24 gage, 0.0239 inch (0.61 mm) thick back panel and 20 gage, 0.0359 inch (0.91 mm) thick sheet steel, exposed front panels, end caps, corners, and joiner pieces.
2. All joints to snap together without fasteners.
3. Provide easily removable front panel.

F. Finish:
1. Factory applied, baked enamel finish.
2. Color: As selected from color chart.

G. Controls: Built-in bi-metal heating thermostat, factory wired.

2.02 ELECTRIC UNIT HEATERS

A. Manufacturers: Basis-of-Design Product: subject to compliance with requirements, provide product indicated on equipment schedule or a comparable product by one of the following:
2. Chromalox.
3. Markel Products.
4. Q-Mark.

B. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for the purpose indicated.

C. Assembly: Suitable for mounting from ceiling or structure above with built-in controls, thermal safety cut-out, and electric terminal box.

D. Acceptable Heating Element Assemblies:
1. Horizontal Projection Units:
   a. Aluminum fins, copper clad brazed to steel sheath and epoxy sealed for moisture resistance.
   b. Nickel chromium resistance wire surrounded with magnesium oxide and sheathed in steel, spiral-finned tubes.
   c. High-mass, all steel tubular type, copper brazed, centrally located and installed in fixed element banks.

E. Housing:
1. Horizontal Projection Units:
   a. Construction materials to consist of heavy gage steel with high gloss baked enamel finish.
   b. Provide with threaded holes for threaded rod suspension.
   c. Provisions for access to internal components for maintenance, adjustments, and repair.

F. Air Inlets and Outlets:
1. Inlets: Provide protective grilles with fan blade guard.
2. Outlets: Provide directional louvers.

G. Fan: Factory balanced, direct drive, axial type with fan guard.

H. Motor: Totally enclosed, thermally protected, and provided with permanently lubricated bearings.

I. Controls:
1. Disconnect.
2. 24-volt relay.
3. Control transformer.

2.03 ELECTRIC WALL HEATERS

A. Manufacturers: Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on equipment schedule or a comparable product by one of the following:
1. Berko.
2. Chromalox, Inc.
3. Indeeco.
4. Markel.
5. Q-Mark.

B. Description: An assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.

C. Cabinet:
   1. Front Panel: Extruded-aluminum bar grille, with removable panels fastened with tamperproof fasteners.
   2. Finish: Baked enamel over baked-on primer with manufacturer's standard color selected by Architect, applied to factory-assembled and tested wall and ceiling heaters before shipping.
   3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

D. Surface-Mounting Cabinet Enclosure: Steel with finish to match cabinet.


F. Fan: Aluminum propeller directly connected to motor.
   1. Motor: Permanently lubricated. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

G. Controls: Unit-mounted thermostat.

H. Electrical Connection: Factory wire motors and controls for a single field connection with disconnect switch.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that surfaces are suitable for installation.

3.02 INSTALLATION
   A. Install in accordance with manufacturer's recommendations.
   B. Install equipment exposed to finished areas after walls and ceilings are finished and painted.
   C. Do not damage equipment or finishes.
   D. Unit Heaters:
      1. Hang from building structure, with pipe hangers anchored to building, not from piping or electrical conduit.
      2. Mount as high as possible to maintain greatest headroom unless otherwise indicated.

3.03 CLEANING
   A. After construction and painting is completed, clean exposed surfaces of units.

3.04 PROTECTION
   A. Provide finished cabinet units with protective covers during the balance of construction.

END OF SECTION
SECTION 26 0050
ELECTRICAL EXECUTION

PART 1 GENERAL

1.01 SUMMARY
A. Section Includes:
   1. Definitions.
   2. Coordination.
   3. Common electrical installation requirements.

1.02 RELATED DOCUMENTS
A. Drawings, General Provisions of the Contract, including General Conditions, Supplementary General Conditions, other Division 00 & 01 Specification Sections, shall apply to this division.
B. These requirements apply to all work in Divisions 26, 27 and 28.

1.03 DEFINITIONS
A. "Approved" means approved by the Engineer and Owner.
B. "Furnish" means to purchase, arrange for delivery to site, and to take delivery at the site.
C. "Install" means to place in position for use.
D. "Provide" means to furnish and install.
E. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
F. 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, overhangs and attics.
G. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
H. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
I. 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.

1.04 COORDINATION
A. Coordination: Coordinate construction operations to ensure efficient and orderly installation of the Work.
   1. Coordinate construction operations, that depend on each other for proper installation, connection, and operation.
   2. 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.
   3. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
   4. Make adequate provisions to accommodate items scheduled for later installation.
   5. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components.
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 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 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.
9. Project closeout activities.

1.05 PROJECT MEETINGS

A. General: Attend meetings and conferences at Project site, unless otherwise indicated.
1. Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Engineer of scheduled meeting dates and times.
2. Agenda: Request the meeting agenda if not furnished prior to meeting.
3. Minutes: Record significant discussions and agreements achieved. Request the meeting minutes if not furnished. Note all discrepancies and notify Engineer of all changes to the Work or to the Contract Documents.

B. Preconstruction Conference: Attend the preconstruction conference before starting construction, no later than 15 days after execution of the Agreement to review responsibilities and personnel assignments.
1. Attendees: Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following as applicable:
   a. Tentative construction schedule.
   b. Phasing.
   c. Critical work sequencing and long-lead items.
   d. Designation of key personnel and their duties.
   e. Procedures for processing field decisions and Change Orders.
   f. Procedures for requests for interpretations (RFIs).
   g. Procedures for testing and inspecting.
   h. Procedures for processing Applications for Payment.
   i. Distribution of the Contract Documents.
   j. Submittal procedures.
   k. LEED requirements.
   l. Preparation of Record Documents.
   m. Use of the premises.
   n. Work restrictions.
   o. Owner's occupancy requirements.
   p. Responsibility for temporary facilities and controls.
   q. Construction waste management and recycling.
   r. Parking availability.
   s. Office, work, and storage areas.
   t. Equipment deliveries and priorities.
   u. First aid.
   w. Progress cleaning.
   x. Working hours.
C. Preinstallation Conferences: Attend a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
   1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
   2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following as applicable:
      b. Options.
      c. Related requests for interpretations (RFIs).
      d. Related Change Orders.
      e. Purchases, deliveries, submittals.
      f. Review of mockups.
      g. Possible conflicts.
      h. Compatibility problems.
      i. Time schedules.
      j. Weather limitations.
      k. Manufacturer's written recommendations.
      l. Warranty requirements.
      m. Compatibility of materials.
      n. Acceptability of substrates.
      o. Space and access limitations.
      p. Regulations of authorities having jurisdiction.
      q. Testing and inspecting requirements.
      r. Installation procedures.
      s. Coordination with other work.
      t. Required performance results.
      u. Protection of adjacent work.
      v. Protection of construction and personnel.
   3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
   4. Reporting: Distribute minutes of the meeting to each party present, to parties who should have been present, and to the Engineer.
   5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

1.06 SUBMITTALS
   A. Alternate Products: Alternate manufacturers, equipment and/or products must be specified or approved prior to bid in writing via addendum to be accepted. All costs associated with deviations from the basis of design shall be borne by the contractor. Deviations shall include alternate manufacturer and/or alternate product and shall include all significant dimensional, performance, electrical, or installation differences from the basis of design products. Costs for reimbursement shall include the costs of other trades affected, and shall include all engineering costs to evaluate such deviations.
   B. Substitutions: Unspecified manufacturers shall be considered substitutions and shall be submitted for consideration under the specified substitution procedures. Substitutions shall be submitted to the engineer for evaluation. If approved by the engineer, substitution shall be offered to the owner for consideration. All costs associated with substitutions shall be borne by the contractor. Costs for reimbursement shall include the costs of other trades affected, and shall include all engineering costs to evaluate such deviations.
C. Coordination Drawings: Prepare Coordination Drawings (coordinated shop drawings) to maximize utilization of space for efficient installation of different components and for installation of products and materials fabricated by separate entities. Submit to Engineer for review before starting work.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
   a. Indicate functional and spatial relationships of components of the work with all other systems and trades.
   b. Indicate required installation sequences.
   c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide sketches of proposed alternate construction to Engineer for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

D. 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 and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project. Submit to Engineer before starting work.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

E. Make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements.

F. If equipment is submitted which differs in arrangement from that shown, provide drawings that show the rearrangement of all associated systems. Approval will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract.

G. Prior to submitting shop drawings for review, contractor shall certify in writing that manufacturers of all major items of equipment have each reviewed drawings and specifications, and have jointly coordinated and properly integrated their equipment and controls to provide a complete and efficient installation.

1.07 WARRANTIES

A. All work shall include a parts and labor warranty on materials and workmanship for a period of 1 year.

B. Refer to Division 01 for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURED CURBS

A. Manufactured Curbs, Equipment Rails, and Other Roof Mounting Assemblies:
   2. Substitutions: Refer to Division 01 - Product Requirements.

B. General requirements: Factory-assembled hollow sheet metal construction with fully mitered and welded corners, integral counterflashing, internal reinforcing, and top side and edges formed to shed water.
   1. Sheet Metal: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33 (230); G60 (Z180) coating designation; 18 gage, 0.048 inch (1.21 mm) thick.
   2. Roofing Cants: Provide integral sheet metal roofing cants dimensioned to begin slope at top of roofing insulation; 1:1 slope; minimum cant height 4 inches (200 mm).
   3. Manufacture curb bottom and mounting flanges for installation directly on roof deck, not on insulation; match slope and configuration of roof deck.
   4. Provide the layouts and configurations shown on the drawings.
C. Equipment Rails: Two-sided curbs in straight lengths, with top horizontal for equipment mounting.
   1. Provide preservative treated wood nailers along top of rails.
   2. Height Above Finished Roof Surface: 6 inches (152 mm), minimum.
   3. Height Above Roof Deck: 14 inches (356 mm), minimum.

D. Pipe, Duct, and Conduit Mounting Pedestals: Vertical posts, minimum 8 inches (400 mm) square unless otherwise indicated.
   1. Provide preservative treated wood nailers over entire top surface, for supports to be provided by others.
   2. Height Above Finished Roof Surface: 12 inches (___ mm), minimum.
   3. Height Above Roof Deck: 14 inches (356 mm), minimum.

2.02 SLEEVES
A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop and 1% outward slope, unless otherwise indicated.
C. Sleeves for Rectangular Openings: Galvanized sheet steel.
   1. Minimum Metal Thickness:
      a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
      b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.03 GROUT
A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
   2. Design Mix: 5000-psi, 28-day compressive strength.

2.04 MECHANICAL SLEEVE SEALS
A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
B. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
C. Pressure Plates: Steel. Include two for each sealing element.
D. Connecting Bolts and Nuts: Steel with corrosion-resistant coating or stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.05 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.
PART 3 EXECUTION

3.01 ELECTRICAL DEMOLITION

A. Refer to Division 01 Section “Cutting and Patching” and Division 02 Section “Selective Structure Demolition” for general demolition requirements and procedures.

B. Contractor shall be responsible for all work and costs associated with demolition shown or noted on plans.

C. Verify exact requirements before bid and include direct and related indirect costs in estimate including permit application, fees, dust control, protection of existing, temporary power, fuel usage, scaffolding, disconnection, disposal, cutting and patching.

D. Occupied Buildings: For occupied buildings, coordinate with local management for communication with building users, occupants, and/or residents regarding potential for disruption, and provide 72 hour advance notification for planned outages. Install new work to the fullest extent possible before interrupting existing services to minimize disruption to residents. Provide temporary power for disruptions lasting over 15 minutes. Assume (midnight to 4am) premium labor rates for power shutdown, changeover and reconnection.

E. In performing the work:
   1. Coordinate with existing conditions and other trades before starting work.
   2. Remove portions of walls, floors, ceilings, etc. required for access to demolished and new work.
   3. Disconnect, demolish, and remove systems, equipment, and components indicated to be removed.
   4. Conduit/Wire to Be Removed: Remove portion indicated to be removed and cap or plug remaining with same or compatible material.
   5. Conduit/Wire Abandoned in Place: Cap or plug with compatible material.
   6. Equipment to Be Removed: Disconnect electrical power. Disconnect and cap services and remove equipment. Remove related supports, anchorages, and concrete bases.
   7. Equipment to Be Removed and Reinstalled: Arrange for disconnection of electrical power. Disconnect and cap services and remove, clean, and store equipment. When appropriate, reinstall, reconnect, arrange for power connection and make equipment operational.
   8. Equipment to Be Removed and Salvaged: Arrange for disconnection of electrical power. Disconnect and cap services, remove equipment and deliver to Owner.

F. If new or existing to remain products are damaged during demolition, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

G. Subcontract the General Contractor to perform patching, repair or replacement of walls, floors, ceilings, etc. removed for access to the work. General contractor shall repair finishes to match surrounding finishes.

3.02 COMMON REQUIREMENTS

A. Install according to requirements and other Division specification sections.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of systems. Indicated locations and arrangements were used for sizing, calculations and other design considerations. Install as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install circuits in concealed locations, unless otherwise indicated and except in equipment rooms and service areas. Where located within walls and other concealed areas subject to damage, provide suitable protection.

D. Conduits indicated to be exposed and piping in equipment rooms and service areas shall be at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install conduits through (preferred) or tight to structure (if approved by architect). If above accessible ceiling, allow sufficient space for ceiling panel removal.
F. Install circuits and disconnects to permit servicing.
G. Install conduits free of sags and bends.
H. Install boxes for changes in direction and branch connections.
I. Install circuits to allow application of insulation.
J. Select system components with voltage rating equal to or greater than system operating voltage.
K. Install escutcheons for penetrations of walls, ceilings, and floors.
L. Comply with NECA 1 and NECA 100. Provide all work plumb, level, and in workmanlike manner.
M. Provide corrosion protection for all work (equipment, conduits, supports, and fasteners) located in exterior, underground, or damp environments.
N. Headroom Maintenance: Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items. If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
O. Right of Way: Give to piping systems installed at a required slope.

3.03 PENETRATIONS

A. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.
B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls. Sleeve ends shall be flush with both wall surfaces unless otherwise noted. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Concrete and masonry penetrations: seal space outside of sleeves with grout. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
C. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
D. Roof-Penetrations: Seal penetration of roof with flexible boot-type flashing units applied in coordination with roofing work.
E. Aboveground, Exterior-Wall Pipe Penetrations: Position pipe in center of sleeve. Maintain 1% outward slope, unless otherwise indicated. Seal penetrations using non-expanding foam. After cured, trim flush with sleeve end and paint with color to match surrounding finish.
F. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.
G. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors. Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07. "Comply with requirements in Division 07."
H. Apply firestopping to penetrations of fire and/or smoke rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07.
I. Penetrations of membranes of rated walls shall be protected by UL listed products. Coordinate exact installation conditions with selected fire sealants supplier. For penetrations which do not have a standard UL installation detail, arrange for engineering determination from sealant supplier and/or manufacturer and provide modifications required to match detail.
3.04 INSTALLATION - COMMON REQUIREMENTS
   A. Install equipment, fixtures, devices, wiring and specialties according to manufacturer installation instructions and recommendations.
   B. Refer to other Sections of these Specifications for additional requirements.
   C. Install to allow maximum possible headroom unless specific mounting heights are indicated.
   D. Install work level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
   E. Install work to facilitate service, maintenance, and repair or replacement of components. Connect work for ease of disconnecting, with minimum interference to other installations. Install work to allow maximum possible headroom unless specific mounting heights are not indicated.
   F. Install work to allow right of way for piping installed at required slope.
   G. Contact equipment manufacturer's representative to visit site and observe installation in order to confirm installation requirements and warranty coverage. Document observation in writing and include in O&M manuals.
   H. Provide service and maintenance for not less than one year from the Date of Substantial Completion or for the warranty period specified in Division 01, whichever is longer. Refer to Division 01 for additional service and requirements.

3.05 CONCRETE BASES
   A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
      1. Provide concrete bases which are plumb, level and fully supported to prevent shifting over time.
      2. Provide concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
      3. Place and secure anchorage devices. Install according to equipment manufacturer's recommendations, setting drawings, templates, diagrams, instructions, and directions for supported equipment. Provide anchor bolts according to anchor-bolt manufacturer's written instructions. Install anchor bolts to elevations required for proper attachment to supported equipment. Unless otherwise noted, install epoxy-coated anchor bolts to match equipment that extend through concrete base, and anchor into structural concrete.
      4. Where located on structural floor, provide dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
      5. Provide 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.06 SUPPORTS AND ANCHORAGES
   A. Provide supports to match construction type and adjacent assembly rating.
   B. For combustible construction, provide wood supports and anchorages. Cut, fit, and place nailers, blocking, and anchorages to support, and anchor materials and equipment. 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. For non-combustible building construction provide metal supports and anchorages. Refer to Division 05 Section "Metal Fabrications" for structural steel. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment. Field Welding shall comply with AWS D1.1.
   D. Attach to substrates as required to support applied loads.

3.07 GROUTING
   A. Clean surfaces that will come into contact with grout. Provide forms as required for placement of grout.
B. Mix and install grout for equipment base bearing surfaces, and anchors.
C. Place grout around anchors and completely filling equipment base and provide smooth bearing surface for equipment. Avoid air entrapment during placement of grout.
D. Allow grout to cure before loading or applying forces.

3.08 SLEEVE-SEAL INSTALLATION
A. Install to seal below-grade exterior wall penetrations.
B. Use 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.

END OF SECTION
SECTION 26 0505
SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Electrical demolition.

1.02 RELATED REQUIREMENTS
   A. Section 01 7000 - Execution and Closeout Requirements: Additional requirements for alterations work.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT
   A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify field measurements and circuiting arrangements are as indicated.
   B. Verify that abandoned wiring and equipment serve only abandoned facilities.
   C. Demolition drawings are based on casual field observation and existing record documents.
   D. Report discrepancies to Architect & Building Systems Engineer before disturbing existing installation.
   E. Beginning demolition means installer accepts existing conditions.

3.02 PREPARATION
   A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
   B. Coordinate utility service outages with utility company.
   C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
   D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
      1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.
      2. Make temporary connections to maintain service in areas adjacent to work area.
      3. Provide temporary power for any outage lasting more than one hour.
   E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.
      1. Notify Owner before partially or completely disabling system.
      2. Notify local fire service.
      3. Make notifications at least 24 hours in advance.
      4. Make temporary connections to maintain service in areas adjacent to work area.
      5. Provide fire watch for system outage over one hour.
   F. Existing Telephone System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
      1. Notify Owner at least 24 hours before partially or completely disabling system.
      2. Notify telephone utility company at least 24 hours before partially or completely disabling system.
      3. Make temporary connections to maintain service in areas adjacent to work area.
G. Existing Cable TV System System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.
   2. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK
A. Remove, relocate, and extend existing installations to accommodate new construction.
B. Remove abandoned wiring to source of supply.
C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
E. Disconnect and remove abandoned panelboards and distribution equipment.
F. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
G. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
H. Repair adjacent construction and finishes damaged during demolition and extension work.
I. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
J. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.04 CLEANING AND REPAIR
A. See Section 01 7419 - Construction Waste Management and Disposal for additional requirements.
B. Clean and repair existing materials and equipment that remain or that are to be reused.
C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
D. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts and broken electrical parts.

END OF SECTION
SECTION 26 0519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Single conductor building wire.
B. Nonmetallic-sheathed cable.
C. Underground feeder and branch-circuit cable.
D. Service entrance cable.
E. Armored cable.
F. Metal-clad cable.
G. Manufactured wiring systems.
H. Wiring connectors.
I. Electrical tape.
J. Heat shrink tubing.
K. Oxide inhibiting compound.
L. Wire pulling lubricant.
M. Cable ties.

1.02 RELATED REQUIREMENTS
A. Section 07 8400 - Firestopping.
B. Section 26 0505 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.
C. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
E. Section 28 4600 - Fire Detection and Alarm: Fire alarm system conductors and cables.
F. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.

1.03 REFERENCE STANDARDS
J. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
K. NECA 104 - Recommended Practice for Installing Aluminum Building Wire and Cable; 2012.
L. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.
M. NECA 121 - Standard for Installing Nonmetallic-Sheathed Cable (Type NM-B) and Underground Feeder and Branch-Circuit Cable (Type UF); 2007.
P. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
Q. UL 4 - Armored Cable; Current Edition, Including All Revisions.
V. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
X. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables; Current Edition, Including All Revisions.
Y. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
Z. UL 719 - Nonmetallic-Sheathed Cables; Current Edition, Including All Revisions.
AA. UL 854 - Service-Entrance Cables; Current Edition, Including All Revisions.
AB. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate the installation of direct burial cable with other trades to avoid conflicts with piping or other potential conflicts.
   3. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
   4. Notify Architect & Building Systems Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Refer to Division 01 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
C. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.
D. Field Quality Control Test Reports.
E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.06 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.
B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS
A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect & Building Systems Engineer and obtain direction before proceeding with work.

PART 2 PRODUCTS
2.01 CONDUCTOR AND CABLE APPLICATIONS
A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
C. Nonmetallic-sheathed cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. For branch circuit wiring in dry locations within one- and two-family dwellings and their attached or detached garages, and their storage buildings.
      b. For branch circuit wiring in dry locations within multifamily dwellings permitted to be of Types III, IV, and V construction.
   2. In addition to other applicable restrictions, may not be used:
      a. Where exposed to view.
      b. Above suspended ceilings.
      c. Where exposed to damage.
      d. For damp, wet, or corrosive locations.
D. Underground feeder and branch-circuit cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. For damp, wet, or corrosive locations as a substitute for NFPA 70, Type NMC nonmetallic-sheathed cable, when nonmetallic-sheathed cable is permitted.
   2. In addition to other applicable restrictions, may not be used:
      a. Where exposed to view.
      b. Where exposed to damage.
E. Service entrance cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. For overhead service drop, installed in raceway from service head.
      b. For underground service entrance, installed in raceway only if USE rated.
   2. In addition to other applicable restrictions, may not be used:
      a. Where exposed to damage.
F. Armored cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
         1) Maximum Length: 6 feet (1.8 m).
      b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
         1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
      c. For general purpose, non-essential electrical systems in non-hazardous patient care areas of health care facilities, when provided with additional insulated grounding conductor for redundant grounding.
   2. In addition to other applicable restrictions, may not be used:
      a. Unless approved by Owner.
      b. Where not approved for use by the authority having jurisdiction.
      c. Where exposed to view.
      d. Where exposed to damage.
      e. For damp, wet, or corrosive locations.
      f. For isolated ground circuits.

G. Metal-clad cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
         1) Maximum Length: 6 feet (1.8 m).
      b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
         1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
   2. In addition to other applicable restrictions, may not be used:
      a. Unless approved by Owner.
      b. Where not approved for use by the authority having jurisdiction.
      c. Where exposed to view.
      d. Where exposed to damage.
      e. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.
      f. For isolated ground circuits, unless provided with an additional isolated/insulated grounding conductor.
      g. For patient care areas of health care facilities requiring redundant grounding.

H. Emergency systems shall include the following restrictions:
   1. Wiring shall remain entirely separate from other wiring and shall use entirely separate equipment, raceways and junction boxes.
   2. Feeder wiring shall use fire resistive cables:
      a. Products shall be listed under category FHJR and installed according to the listing.
      b. Other means and methods may be used if permitted by code as determined by the AHJ.

I. Manufactured wiring systems are permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. For branch circuits where concealed above accessible ceilings for lighting.
      b. For general purpose, non-essential electrical systems in non-hazardous patient care areas of health care facilities, when provided with additional insulated grounding conductor for redundant grounding.
   2. In addition to other applicable restrictions, may not be used:
      a. Unless approved by Owner.
b. Where not approved for use by the authority having jurisdiction.

c. Where exposed to view.

d. Where exposed to damage.

e. For damp, wet, or corrosive locations.

f. For isolated ground circuits, unless provided with an additional isolated/insulated grounding conductor.

2.02 CONDUCTOR AND CABLE MANUFACTURERS


D. Substitutions: Refer to Division 01 - Product Requirements.

2.03 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Provide new conductors and cables manufactured not more than one year prior to installation.

D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

E. Comply with NEMA WC 70.

F. Comply with FS A-A-59544 where applicable.

G. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

H. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

I. Conductor and Cables Installed Where Exposed to Direct Rays of Sun: Listed and labeled as sunlight resistant.

J. Conductor Material:

1. Provide copper conductors except where aluminum conductors are specifically indicated or permitted for substitution. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.

   a. Substitution of aluminum conductors for copper is permitted, when approved by Owner and authority having jurisdiction, only for the following:

      1) Services: Copper conductors size 6 AWG and larger.
      2) Feeders: Copper conductors size 6 AWG and larger.

   b. Where aluminum conductors are substituted for copper, comply with the following:

      1) Size aluminum conductors to provide, when compared to copper sizes indicated, equivalent or greater ampacity and equivalent or less voltage drop.
      2) Increase size of raceways, boxes, wiring gutters, enclosures, etc. as required to accommodate aluminum conductors.
      3) Provide aluminum equipment grounding conductor sized according to NFPA 70.
      4) Equip electrical distribution equipment with compression lugs for terminating aluminum conductors.

2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.

3. Tinned Copper Conductors: Comply with ASTM B33.
4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

M. Minimum Conductor Size:
1. Branch Circuits: 14 AWG permitted only for 15 Amp branch circuits less than 50 feet in length. Otherwise, 12 AWG conductors shall be used.
   a. Exceptions:
      1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
      2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
      3) 20 A, 277 V circuits longer than 150 feet (46 m): 10 AWG, for voltage drop.
2. Control Circuits: 14 AWG.

N. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

O. Conductor Color Coding:
1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
   a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
3. Color Code:
   a. 208Y/120 V, 3 Phase, 4 Wire System:
      1) Phase A: Black.
      2) Phase B: Red.
      3) Phase C: Blue.
      4) Neutral/Grounded: White.
   b. 240/120 V, 1 Phase, 3 Wire System:
      1) Phase A: Black.
      2) Phase B: Red.
      3) Neutral/Grounded: White.
   c. Equipment Ground, All Systems: Green.
   d. Travelers for 3-Way and 4-Way Switching: Pink.
   e. For control circuits, comply with manufacturer's recommended color code.

2.04 SINGLE CONDUCTOR BUILDING WIRE
A. Description: Single conductor insulated wire.
B. Conductor Stranding:
   1. Feeders and Branch Circuits:
      b. Size 8 AWG and Larger: Stranded.
   2. Control Circuits: Stranded.
C. Insulation Voltage Rating: 600 V.
D. Insulation:
   1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
   2. Aluminum Building Wire (only where specifically indicated or permitted for substitution): Type XHHW-2.

2.05 NONMETALLIC-SHEATHED CABLE
A. Description: NFPA 70, Type NM multiple-conductor cable listed and labeled as complying with UL 719, Type NM-B.
B. Conductor Stranding:
   2. Size 8 AWG and Larger: Stranded.
C. Insulation Voltage Rating: 600 V.
2.06 UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE
A. Description: NFPA 70, Type UF multiple-conductor cable listed and labeled as complying with UL 493, Type UF-B.
B. Provide equipment grounding conductor unless otherwise indicated.
C. Conductor Stranding:
   2. Size 8 AWG and Larger: Stranded.
D. Insulation Voltage Rating: 600 V.
E. Cable Jacket: Listed and labeled as sunlight resistant.

2.07 SERVICE ENTRANCE CABLE
A. Service Entrance Cable for Above-Ground Use: NFPA 70, Type SE multiple-conductor cable listed and labeled as complying with UL 854, Style R.
B. Service Entrance Cable for Underground Use: NFPA 70, Type USE single-conductor cable listed and labeled as complying with UL 854, Type USE-2, and with UL 44, Type RHH/RHW-2.
C. Conductor Stranding: Stranded.
D. Insulation Voltage Rating: 600 V.

2.08 ARMORED CABLE
A. Description: NFPA 70, Type AC cable listed and labeled as complying with UL 4, and listed for use in classified firestop systems to be used.
B. Conductor Stranding:
   2. Size 8 AWG and Larger: Stranded.
C. Insulation Voltage Rating: 600 V.
D. Insulation: Type THHN.
E. Grounding: Combination of interlocking armor and integral bonding wire.
F. Armor: Steel, interlocked tape.

2.09 METAL-CLAD CABLE
A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
B. Conductor Stranding:
   2. Size 8 AWG and Larger: Stranded.
C. Insulation Voltage Rating: 600 V.
D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
E. Grounding: Full-size integral equipment grounding conductor.
F. Armor: Steel, interlocked tape.
G. Provide PVC jacket applied over cable armor where indicated or required for environment of installed location.

2.10 MANUFACTURED WIRING SYSTEMS
A. Description: Manufactured wiring assemblies complying with NFPA 70 Article 604, and listed and labeled as complying with UL 183.
B. Provide components necessary to transition between manufactured wiring system and other wiring methods.
C. Branch Circuit Cables:
2. Insulation Voltage Rating: 600 V.
3. Insulation: Type THHN.
5. Armor: Steel, interlocked tape.

D. Connectors: Keyed and color-coded to prevent interconnection of different voltages.
E. Fixture Leads: Type TFN insulation.

2.11 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
B. Connectors for Grounding and Bonding: Comply with Section 26 0526.
C. Wiring Connectors for Splices and Taps:
   1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
   2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
D. Wiring Connectors for Terminations:
   1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
   2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
   3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
   4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
   5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
   6. Aluminum Conductors: Use compression connectors for all connections.
   7. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
   8. Conductors for Control Circuits: Use crimped terminals for all connections.
E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
H. Mechanical Connectors: Provide bolted type or set-screw type.
I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

2.12 WIRING ACCESSORIES

A. Electrical Tape:
   1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
      a. Substitutions: See Section 01 6000 - Product Requirements.
2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).

3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.

4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).

5. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

E. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Circuiting Requirements:

1. Unless dimensioned, circuit routing indicated is diagrammatic.

2. When circuit destination is indicated without specific routing, determine exact routing required.

3. Arrange circuiting to minimize splices.

4. Maintain separation of wiring for emergency systems in accordance with NFPA 70.

5. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.

a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.

b. Increase size of conductors as required to account for ampacity derating.

c. Size raceways, boxes, etc. to accommodate conductors.

6. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

a. Branch circuits fed from ground fault circuit interrupter (GFCI) circuit breakers.

b. Branch circuits fed from feed-through protection of GFI receptacles.

c. Branch circuits with dimming controls.
d. Branch circuits with isolated grounding conductor.
B. Install products in accordance with manufacturer's instructions.
C. Perform work in accordance with NECA 1 (general workmanship).
D. Install aluminum conductors in accordance with NECA 104.
E. Install nonmetallic-sheathed cable (Type NM-B) in accordance with NECA 121.
F. Install underground feeder and branch-circuit cable (Type UF-B) in accordance with NECA 121.
G. Install armored cable (Type AC) in accordance with NECA 120.
H. Install metal-clad cable (Type MC) in accordance with NECA 120.
I. Installation in Raceway:
   1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
   2. Pull all conductors and cables together into raceway at same time.
   3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
   4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
J. Exposed Cable Installation (only where specifically permitted):
   1. Route cables parallel or perpendicular to building structural members and surfaces.
   2. Protect cables from physical damage.
K. Direct Burial Cable Installation:
   1. Provide trenching and backfilling in accordance with Sections 31 2316 and 31 2323.
   2. Install cable with minimum cover of 36 inches (914 mm) unless otherwise indicated or required.
   3. Protect cables from damage in accordance with NFPA 70.
   4. Provide underground warning tape in accordance with Section 26 0553 along entire cable length.
L. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
M. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
   1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
N. Terminate cables using suitable fittings.
   1. Armored Cable (Type AC):
      a. Use listed fittings and anti-short, insulating bushings.
      b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
      c. Do not use direct-bearing set-screw type fittings for cables with aluminum armor.
   2. Metal-Clad Cable (Type MC):
      a. Use listed fittings.
      b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
      c. Do not use direct-bearing set-screw type fittings for cables with aluminum armor.
O. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
P. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
Q. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

R. Make wiring connections using specified wiring connectors.
   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
   2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
   3. Do not remove conductor strands to facilitate insertion into connector.
   4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminants. Do not use wire brush on plated connector surfaces.
   5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
   6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

S. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
   1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
      a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
   2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
      a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
      b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.

T. Insulate ends of spare conductors using vinyl insulating electrical tape.

U. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

V. Identify conductors and cables in accordance with Section 26 0553.

W. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

X. Life safety wiring/raceways shall be run within separate fire rated assemblies, protected by listed thermal barrier systems (FHIT), or other approved means and methods.

Y. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL
   A. Refer to Division 01 - Quality Requirements, for additional requirements.
   B. Inspect and test in accordance with NETA ATS, except Section 4.
   C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
   D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
A. Grounding and bonding requirements.
B. Conductors for grounding and bonding.
C. Connectors for grounding and bonding.
D. Ground bars.
E. Ground rod electrodes.
F. Ground enhancement material.

1.02 REFERENCE STANDARDS
A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
F. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. Verify exact locations of underground metal water service pipe entrances to building.
   2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
   3. Notify Architect & Building Systems Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
B. Sequencing:
   1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.04 SUBMITTALS
A. Refer to Division 01 - Administrative Requirements for submittals procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
C. Field quality control test reports.
D. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.05 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS
A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

E. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect & Building Systems Engineer. Precipitation within the previous 48 hours does not constitute normally dry conditions.

F. Grounding Electrode System:
   1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
      a. Provide continuous grounding electrode conductors without splice or joint.
      b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
   2. Metal Underground Water Pipe(s):
      a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet (3.0 m) at an accessible location not more than 5 feet (1.5 m) from the point of entrance to the building.
      b. Provide bonding jumper(s) around insulating joints/ pipes as required to make pipe electrically continuous.
      c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
   3. Metal In-Ground Support Structure:
      a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
   4. Concrete-Encased Electrode:
      a. Provide connection to concrete-encased electrode consisting of not less than 20 feet (6.0 m) of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
   5. Ground Ring:
      a. If a lightning protection system is installed, provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 2 AWG in direct contact with earth, installed at a depth of not less than 30 inches (750 mm).
      b. Where location is not indicated, locate ground ring conductor at least 24 inches (600 mm) outside building perimeter foundation.
      c. Provide ground enhancement material around conductor.
      d. Provide connection from ground ring conductor to:
         1) Perimeter columns of metal building frame.
         2) Ground rod electrodes located at each corner of the building/structure.
   6. Ground Rod Electrode(s):
      a. Where less than two other grounding electrodes are not present, provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
      b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.
      c. Where location is not indicated, locate electrode(s) at least 5 feet (1.5 m) outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
   7. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70.
Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.

a. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.

G. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
   a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
8. Provide bonding and equipment grounding for pools and fountains and associated equipment in accordance with NFPA 70.

H. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
   a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
   b. Raceway Size: 3/4 inch (21 mm) trade size unless otherwise indicated or required.
   c. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.
   d. Ground Bar Mounting Height: 18 inches (450 mm) above finished floor unless otherwise indicated.

I. Lightning Protection Systems, in Addition to Requirements of Section 26 4113:
1. Do not use grounding electrode dedicated for lightning protection system for component of building grounding electrode system provided under this section.
2. Provide bonding of building grounding electrode system provided under this section and lightning protection grounding electrode system in accordance with NFPA 70 and NFPA 780.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0526:
1. Use insulated copper conductors unless otherwise indicated.
   a. Exceptions:
      1) Use bare copper conductors where installed underground in direct contact with earth.
2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
   1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
   2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
   3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Ground Bars:
   1. Description: Copper rectangular ground bars with mounting brackets and insulators.
   2. Size: As indicated.
   3. Holes for Connections: As indicated or as required for connections to be made.

E. Ground Rod Electrodes:
   1. Comply with NEMA GR 1.
   3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.

F. Ground Enhancement Material:
   1. Description: Factory-mixed conductive material designed for permanent and maintenance-free improvement of grounding effectiveness by lowering resistivity.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that work likely to damage grounding and bonding system components has been completed.
   B. Verify that field measurements are as indicated.
   C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION
   A. Install products in accordance with manufacturer's instructions.
   B. Perform work in accordance with NECA 1 (general workmanship).
   C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.
      1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches (150 mm) below finished grade.
      2. Indoor Installations: Unless otherwise indicated, install with 4 inches (100 mm) of top of rod exposed.
   D. Make grounding and bonding connections using specified connectors.
      1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
      2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
      3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
      4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
      5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
   E. Identify grounding and bonding system components in accordance with Section 26 0553.
3.03 FIELD QUALITY CONTROL

A. Refer to Division 01 - Quality Requirements, for additional requirements.
B. Inspect and test in accordance with NETA ATS except Section 4.
C. Perform inspections and tests listed in NETA ATS, Section 7.13.
D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION
SECTION 26 0529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS
A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.
B. Section 05 5000 - Metal Fabrications: Materials and requirements for fabricated metal supports.
C. Section 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
D. Section 26 0533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
E. Section 26 5100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.
F. Section 26 5600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.03 REFERENCE STANDARDS
D. MFMA-4 - Metal Framing Standards Publication; 2004.
E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Architect & Building Systems Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.05 SUBMITTALS
A. Refer to Division 01 - Administrative Requirements, for submittal procedures.

1.06 QUALITY ASSURANCE
A. Comply with NFPA 70.
**B. Comply with applicable building code.**

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
   a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
   b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.

1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.


E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.

F. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

### PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect & Building Systems Engineer, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect & Building Systems Engineer, do not provide support from roof deck.
F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Conduit Support and Attachment: Also comply with Section 26 0533.13.

I. Box Support and Attachment: Also comply with Section 26 0533.16.

J. Interior Luminaire Support and Attachment: Also comply with Section 26 5100.

K. Exterior Luminaire Support and Attachment: Also comply with Section 26 5600.

L. Secure fasteners according to manufacturer's recommended torque settings.

M. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. Refer to Division 01 - Quality Requirements, for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).
B. Intermediate metal conduit (IMC).
C. PVC-coated galvanized steel rigid metal conduit (RMC).
D. Flexible metal conduit (FMC).
E. Liquidtight flexible metal conduit (LFMC).
F. Electrical metallic tubing (EMT).
G. Rigid polyvinyl chloride (PVC) conduit.
H. Electrical nonmetallic tubing (ENT).
I. Liquidtight flexible nonmetallic conduit (LFNC).
J. Reinforced thermosetting resin conduit (RTRC).
K. Conduit fittings.
L. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Concrete encasement of conduits.
B. Section 07 8400 - Firestopping.
C. Section 26 0526 - Grounding and Bonding for Electrical Systems.
   1. Includes additional requirements for fittings for grounding and bonding.
D. Section 26 0529 - Hangers and Supports for Electrical Systems.
E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
F. Section 26 2100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.
G. Section 27 1000 - Structured Cabling: Additional requirements for communications systems conduits.
H. Section 31 2316 - Excavation.
I. Section 31 2323 - Fill: Bedding and backfilling.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.
B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.
C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.
D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2003.
G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.
H. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; 2005.
I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.
J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2015.
K. NEMA TC 13 - Electrical Nonmetallic Tubing (ENT); 2014.
L. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.
M. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
N. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
O. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
P. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
Q. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
R. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
S. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
T. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
   4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
   5. Notify Architect & Building Systems Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.05 SUBMITTALS
A. Refer to Division 01 - Administrative Requirements for submittals procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
C. Shop Drawings:
   1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
   2. Include proposed locations of roof penetrations and proposed methods for sealing.
D. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.

1.06 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer’s instructions.
PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS
A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
C. Underground:
   1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
   2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
   3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
   4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
   5. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.
   6. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.
D. Exposed, Exterior: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit.
E. Connections to Vibrating Equipment:
   1. Dry Locations: Use flexible metal conduit.
   2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
   3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.

2.02 CONDUIT REQUIREMENTS
A. Electrical Service Conduits: Also comply with Section 26 2100.
B. Communications Systems Conduits: Also comply with Section 27 1000.
C. Fittings for Grounding and Bonding: Also comply with Section 26 0526.
D. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
E. Provide products listed, classified, and labeled as suitable for the purpose intended.
F. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)
A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
B. Fittings:
   1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.
2.04 INTERMEDIATE METAL CONDUIT (IMC)
A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
B. Fittings:
   1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.05 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)
A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.
B. Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil (1.02 mm).
C. PVC-Coated Fittings:
   1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
   2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
   3. Material: Use steel or malleable iron.
   4. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil (1.02 mm).
D. PVC-Coated Supports: Furnish with exterior coating of polyvinyl chloride (PVC), minimum thickness of 15 mil (0.38 mm).

2.06 FLEXIBLE METAL CONDUIT (FMC)
A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.

2.07 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)
A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.

2.08 ELECTRICAL METALLIC TUBING (EMT)
A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use compression (gland) or set-screw type.
      a. Do not use indenter type connectors and couplings.

2.09 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT
A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
2.10 ELECTRICAL NONMETALLIC TUBING (ENT)

A. Description: NFPA 70, Type ENT electrical nonmetallic tubing complying with NEMA TC 13 and listed and labeled as complying with UL 1653.

B. Fittings:
   1. Manufacturer: Same as manufacturer of ENT to be connected.
   2. Use solvent-welded type fittings.
   3. Solvent-Welded Fittings: Rigid PVC fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; suitable for use with ENT.

2.11 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT (LFNC)

A. Description: NFPA 70, Type LFNC liquidtight flexible nonmetallic conduit listed and labeled as complying with UL 1660.

B. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B; suitable for the type of conduit to be connected.

2.12 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

A. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).

B. Supports: Per manufacturer's recommendations.

C. Fittings: Same type and manufacturer as conduit to be connected.

2.13 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil (0.51 mm).

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Epoxy Adhesive for RTRC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

E. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force (890 N).

F. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.

G. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
E. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
F. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
G. Install electrical nonmetallic tubing (ENT) in accordance with NECA 111.
H. Install liquidtight flexible nonmetallic conduit (LFNC) in accordance with NECA 111.
I. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. Conceal all conduits unless specifically indicated to be exposed.
   3. Conduits in the following areas may be exposed, unless otherwise indicated:
      a. Electrical rooms.
      b. Mechanical equipment rooms.
      c. Within joists in areas with no ceiling.
   4. Unless otherwise approved, do not route conduits exposed:
      a. Across floors.
      b. Across roofs.
      c. Across top of parapet walls.
      d. Across building exterior surfaces.
   5. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
   6. Arrange conduit to maintain adequate headroom, clearances, and access.
   7. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
   8. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
   9. Route conduits above water and drain piping where possible.
J. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
K. Connections and Terminations:
   1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
   2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
   3. Use suitable adapters where required to transition from one type of conduit to another.
   4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
   5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
   6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
   7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
L. Penetrations:
   1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
   2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
8. Provide metal escutcheon plates for conduit penetrations exposed to public view.
9. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

M. Underground Installation:
1. Provide trenching and backfilling in accordance with Sections 31 2316 and 31 2323.
2. Minimum Cover, Unless Otherwise Indicated or Required:
   a. as required by NFPA 70 (NEC).
3. Provide underground warning tape in accordance with Section 26 0553 along entire conduit length for service entrance where not concrete-encased.

N. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 03 3000 with minimum concrete cover of 3 inches (76 mm) on all sides unless otherwise indicated.

O. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
4. Where conduits are subject to earth movement by settlement or frost.

P. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
3. Where conduits penetrate coolers or freezers.

Q. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.

R. Provide grounding and bonding in accordance with Section 26 0526.

S. Identify conduits in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL
A. Refer to Division 01 - Quality Requirements, for additional requirements.
B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer’s instructions.
D. Correct deficiencies and replace damaged or defective conduits.
3.04 CLEANING
   A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION
   A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION
SECTION 26 0533.16
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 08 3100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
B. Section 26 0529 - Hangers and Supports for Electrical Systems.
C. Section 26 0533.13 - Conduit for Electrical Systems:
   1. Conduit bodies and other fittings.
D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
E. Section 26 2726 - Wiring Devices:
   1. Wall plates.
   2. Floor box service fittings.
   3. Additional requirements for locating boxes for wiring devices.
F. Section 27 1000 - Structured Cabling: Additional requirements for communications systems outlet boxes.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.
D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.
E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
   4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
   5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
   6. Coordinate the work with other trades to preserve insulation integrity.
   7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect & Building Systems Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

**1.04 SUBMITTALS**

A. Refer to Division 01 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.

C. Samples:
   1. Floor Boxes: Provide one sample(s) of each floor box proposed for substitution upon request.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.

**1.05 QUALITY ASSURANCE**

A. Conform to requirements of NFPA 70.

**1.06 DELIVERY, STORAGE, AND HANDLING**

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

**PART 2 PRODUCTS**

**2.01 BOXES**

A. General Requirements:
   1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
   2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
   3. Provide products listed, classified, and labeled as suitable for the purpose intended.
   4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
   5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
   1. Use sheet-steel boxes or fire rated boxes for dry locations unless otherwise indicated or required.
   2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
   3. Use suitable concrete type boxes where flush-mounted in concrete.
   4. Use suitable masonry type boxes where flush-mounted in masonry walls.
   5. Use raised covers suitable for the type of wall construction and device configuration where required.
   6. Use shallow boxes where required by the type of wall construction.
   7. Do not use "through-wall" boxes designed for access from both sides of wall.
   8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
   9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
   10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.

12. Minimum Box Size, Unless Otherwise Indicated:
   a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
   b. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.

13. Wall Plates: Comply with Section 26 2726.

14. Manufacturers:
   e. Thomas & Betts Corporation: www.tnb.com/#sle.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
   1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
   2. NEMA 250 Environment Type, Unless Otherwise Indicated.
   3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
      a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
   4. Finish for Painted Steel Enclosures: Primed and field painted with color selected by architect unless otherwise indicated.

D. Floor Boxes:
   1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 2726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
   2. Use cast iron floor boxes within slab on grade.
   3. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
   4. Manufacturer: Same as manufacturer of floor box service fittings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

E. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

F. Box Locations:
   1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 3100 as required where approved by the Architect.
   2. Unless dimensioned, box locations indicated are approximate.
   3. Locate boxes as required for devices installed under other sections or by others.
      a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 2726.
      b. Communications Systems Outlets: Comply with Section 27 1000.
   4. Locate boxes so that wall plates do not span different building finishes.
   5. Locate boxes so that wall plates do not cross masonry joints.
6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.

7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 24 inch horizontal separation unless otherwise listed and/or approved by the AHJ.

8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) horizontal separation.

9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
   a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads, and/or use other listed and approved means or methods to maintain fire rating.
   b. Do not install flush-mounted boxes with area larger than 16 square inches (0.0103 sq m) or such that the total aggregate area of openings exceeds 100 square inches (0.0645 sq m) for any 100 square feet (9.29 sq m) of wall area unless using other listed and approved means or methods to maintain fire rating.

10. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
    a. Concealed above accessible suspended ceilings.
    b. Within joists in areas with no ceiling.
    c. Electrical rooms.
    d. Mechanical equipment rooms.

G. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

H. Install boxes plumb and level.
I. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.

J. Install boxes as required to preserve insulation integrity.
K. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.
L. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
M. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
N. Close unused box openings.
O. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
P. Provide grounding and bonding in accordance with Section 26 0526.
3.02 CLEANING
   A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.03 PROTECTION
   A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION
SECTION 26 0553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Electrical identification requirements.
B. Identification nameplates and labels.
C. Wire and cable markers.
D. Underground warning tape.
E. Warning signs and labels.

1.02 RELATED REQUIREMENTS
A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

1.03 REFERENCE STANDARDS
C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
D. NFPA 70E - Standard for Electrical Safety in the Workplace; 2015.

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordination:

1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
B. Sequencing:

1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
2. Do not install identification products until final surface finishes and painting are complete.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS
A. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
   a. Switchboards:
      1) Identify ampere rating.
      2) Identify voltage and phase.
      3) Identify power source and circuit number. Include location when not within sight of equipment.
      4) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
   b. Panelboards:
      1) Identify power source and circuit number. Include location when not within sight of equipment.
      2) Use typewritten circuit directory (1/8" font minimum) to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
   c. Transformers:
      1) Identify kVA rating.
      2) Identify voltage and phase for primary and secondary.
      3) Identify load(s) served. Include location.
d. Enclosed switches, circuit breakers, and motor controllers:
   1) Identify voltage and phase.
   2) Identify power source and circuit number. Include location when not within sight of equipment.
   3) Identify load(s) served. Include location when not within sight of equipment.

e. Time Switches:
   1) Identify load(s) served and associated circuits controlled. Include location.

f. Enclosed Contactors:
   1) Identify ampere rating.
   2) Identify voltage and phase.
   3) Identify configuration, e.g., E.O.E.H. (electrically operated, electrically held) or E.O.M.H. (electrically operated, mechanically held).
   4) Identify coil voltage.
   5) Identify load(s) and associated circuits controlled. Include location.

g. Transfer Switches:
   1) Identify voltage and phase.
   2) Identify power source and circuit number for both normal power source and standby power source. Include location when not within sight of equipment.
   3) Identify load(s) served. Include location when not within sight of equipment.
   4) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.

2. Service Equipment:
   a. Use identification nameplate to identify each service disconnecting means.
   b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.

3. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70, including but not limited to the following.
   a. Service equipment.
   b. Industrial control panels.
   c. Motor control centers.
   d. Elevator control panels.
   e. Industrial machinery.

4. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
   a. Minimum Size: 3.5 by 5 inches (89 mm by 127 mm).
   b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.

5. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.

6. Use warning labels, identification nameplates, or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message "DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.

B. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.
2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
   a. At each source and load connection.
   b. Within boxes when more than one circuit is present.
   c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
4. Use underground warning tape to identify direct buried cables.
C. Identification for Devices:
   1. Use identification label to identify fire alarm system devices.
      a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.
   2. Use identification label to identify serving branch circuit for all receptacles.
      a. For receptacles in all locations, provide identification on inside surface of wallplate.

2.02 IDENTIFICATION NAMEPLATES AND LABELS
A. Identification Nameplates:
   1. Materials:
      a. Indoor Clean, Dry Locations: Use plastic nameplates.
      b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
   2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
   3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
   4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
   5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.
B. Identification Labels:
   1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
   2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
C. Format for Equipment Identification:
   1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
   2. Legend:
      a. Equipment designation or other approved description.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height:
      a. Equipment Designation: 1/2 inch (13 mm).
   5. Color:
      c. Fire Alarm System: White text on red background.
D. Format for Receptacle Identification:
   1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
   2. Legend: Power source and circuit number or other designation indicated.
   3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch (5 mm).
5. Color: Black text on clear background.

2.03 WIRE AND CABLE MARKERS
A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
C. Legend: Power source and circuit number or other designation indicated.
D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
E. Minimum Text Height: 1/8 inch (3 mm).
F. Color: Black text on white background unless otherwise indicated.

2.04 UNDERGROUND WARNING TAPE
A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).
C. Legend: Type of service, continuously repeated over full length of tape.
D. Color.

2.05 WARNING SIGNS AND LABELS
A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
B. Warning Signs:
   1. Materials.
   2. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.
C. Warning Labels:
   1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
   3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION
3.01 PREPARATION
A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION
A. Install products in accordance with manufacturer's instructions.
B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
   4. Elevated Equipment: Legible from the floor or working platform.
   5. Interior Components: Legible from the point of access.
   6. Conductors and Cables: Legible from the point of access.
   7. Devices: Inside face of cover.
C. Install identification products centered, level, and parallel with lines of item being identified.
D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
   1. Do not use adhesives on exterior surfaces except where substrate cannot be penetrated.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.

G. Secure rigid signs using stainless steel screws.

H. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

A. Refer to Division 01 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION
SECTION 26 0583
WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS
A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.
B. Section 26 0533.13 - Conduit for Electrical Systems.
C. Section 26 0533.16 - Boxes for Electrical Systems.
D. Section 26 2726 - Wiring Devices.
E. Section 26 2816.16 - Enclosed Switches.

1.03 REFERENCE STANDARDS
A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R 2010).
B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2012.
C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
   2. Determine connection locations and requirements.

1.05 SUBMITTALS
A. Refer to Division 01 - Administrative Requirements, for submittal procedures.

1.06 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.
B. Products: Listed, classified, and labeled as suitable for the purpose intended.

PART 2 PRODUCTS

2.01 MATERIALS
A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Conform to NEMA WD 1.
   2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
   3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
B. Disconnect Switches: As specified in Section 26 2816.16 and in individual equipment sections.
C. Wiring Devices: As specified in Section 26 2726.
D. Flexible Conduit: As specified in Section 26 0533.13.
E. Wire and Cable: As specified in Section 26 0519.
F. Boxes: As specified in Section 26 0533.16.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify that equipment is ready for electrical connection, wiring, and energization.
3.02 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.
B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
D. Provide receptacle outlet to accommodate connection with attachment plug.
E. Provide cord and cap where field-supplied attachment plug is required.
F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
H. Install terminal block jumpers to complete equipment wiring requirements.
I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.
J. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

END OF SECTION
PART 1 GENERAL

1.01 RELATED REQUIREMENTS
   A. Section 26 0529 - Hangers and Supports for Electrical Systems.
   B. Section 26 0533.16 - Boxes for Electrical Systems.
   C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
   D. Section 26 2726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.

1.02 REFERENCE STANDARDS
   C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
   D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
   E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
   F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
   G. UL 773 - Plug-in, Locking Type Photocontrols for Use with Area Lighting; Current Edition, Including All Revisions.
   J. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS
   A. Provide products listed, classified, and labeled as suitable for the purpose intended.
   B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.02 TIME SWITCHES
   A. Digital Electronic Time Switches:
      1. Description: Factory-assembled solid state programmable controller with LCD display, listed and labeled as complying with UL 916 or UL 917.
      2. Program Capability:
         a. Astronomic Time Switches (outdoor circuits): Single channel, capable of different schedule for each day of the week with additional holiday schedule available to override normal schedule for selected days and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.
      3. Schedule Capacity: Not less than 16 programmable on/off operations.
      4. Provide automatic daylight savings time and leap year compensation.
      5. Provide power outage backup to retain programming and maintain clock.
      6. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
      7. Provide remote photocell input with light level adjustment.
8. Input Supply Voltage: As indicated on the drawings.

B. Electromechanical Time Switches:
1. Description: Factory-assembled controller with motor-operated timing dial mechanism and adjustable trippers for setting on/off operations, listed and labeled as complying with UL 917.
2. Program Capability:
   a. 24-Hour Time Switches (indoor circuits): With same schedule for each day of the week and skip-a-day feature to omit selected days.
3. Schedule Capacity:
   a. 24-Hour Time Switches: Accommodating not less than 12 pairs of selected on/off operations per day.
4. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
5. Input Supply Voltage: As indicated on the drawings.
6. Provide lockable enclosure; environmental type per NEMA 250 as specified for the following installation locations:

2.03 OUTDOOR PHOTO CONTROLS

A. Stem-Mounted Outdoor Photo Controls:
1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
2. Housing: Weatherproof, impact resistant polycarbonate.
4. Provide external sliding shield for field adjustment of light level activation.
5. Light Level Activation: 1 to 5 footcandles (10.8 to 53.8 lux) turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
6. Voltage: As required to control the load indicated on the drawings.
7. Failure Mode: Fails to the on position.
8. Load Rating: As required to control the load indicated on the drawings.

B. Locking Receptacle-Mounted Outdoor Photo Controls
1. Description: Plug-in locking type photo control unit complying with ANSI C136.10 for mounting on a compatible receptacle, listed and labeled as complying with UL 773.
2. Housing: Weatherproof, impact resistant UV stabilized polypropylene, color to be selected.
4. Light Level Activation: 1 to 3 footcandles (10.8 to 32.3 lux) turn-on and 1.5 to 1 turn-off to turn-on ratio with instant turn-on and delayed turn-off.
5. Voltage: As required to control the load indicated on the drawings.
6. Failure Mode: Fails to the on position.
7. Load Rating: As required to control the load indicated on the drawings.

C. Button Type Outdoor Photo Controls
1. Description: Direct-wired photo control unit complying with ANSI C136.24 with weatherproof gasketed wall plate where required or indicated, listed and labeled as complying with UL 773A.
2. Housing: Weather resistant polycarbonate.
4. Light Level Activation: 1 to 3 footcandles (10.8 to 32.3 lux) turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
5. Voltage: As required to control the load indicated on the drawings.
6. Failure Mode: Fails to the on position.
7. Load Rating: As required to control the load indicated on the drawings.
PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that field measurements are as indicated.
   B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
   C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
   D. Verify that final surface finishes are complete, including painting.
   E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
   F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
   G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION
   A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
   B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of lighting control devices provided under this section.
   C. Install lighting control devices in accordance with manufacturer’s instructions.
   D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
   E. Install lighting control devices plumb and level, and held securely in place.
   F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 2726.
   G. Provide required supports in accordance with Section 26 0529.
   H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
   I. Identify lighting control devices in accordance with Section 26 0553.
   J. Outdoor Photo Control Locations:
      1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.
      2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.
   K. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.

3.03 FIELD QUALITY CONTROL
   A. Refer to Division 01 - Quality Requirements, for additional requirements.
   B. Inspect each lighting control device for damage and defects.
   C. Test time switches to verify proper operation.
   D. Test outdoor photo controls to verify proper operation, including time delays where applicable.
   E. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.04 ADJUSTING
   A. Adjust devices and wall plates to be flush and level.
B. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Architect & Building Systems Engineer. Record settings in written report to be included with submittals.

C. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect & Building Systems Engineer.

3.05 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

A. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Location: At project site.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Electrical service requirements.

1.02 PRICE AND PAYMENT PROCEDURES
   A. Allowances:
      1. Refer to Division 01 - Allowances, for allowances affecting this section.
      2. Include cash allowance for Utility Company charges associated with providing service.

1.03 REFERENCE STANDARDS
   B. NEC 1 - Standard for Good Workmanship in Electrical Construction; 2015.
   C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS
   A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.
   B. Coordination:
      1. Verify the following with Utility Company representative:
         a. Utility Company requirements, including division of responsibility.
         b. Exact location and details of utility point of connection.
         c. Utility easement requirements.
         d. Utility Company charges associated with providing service.
      2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
      3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.
      4. Coordinate the work with other installers to provide communication lines required for Utility Company meters.
      5. Notify Architect & Building Systems Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
   C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.
   D. Utility Company charges associated with providing permanent service to be paid by Owner.
   E. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.
   F. Scheduling:
      1. Where work of this section involves interruption of existing electrical service, arrange service interruption with Owner.
      2. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.05 SUBMITTALS
   A. Refer to Division 01 - Administrative Requirements, for submittal procedures.
   B. Utility Company letter of availability for providing electrical service to project.
   C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product. Include ratings, configurations, standard wiring diagrams, outline and support point dimensions, finishes, weights, service condition requirements, and installed features.
D. Shop Drawings: Include dimensioned plan views and sections indicating locations and arrangement of Utility Company and service entrance equipment, metering provisions, required clearances, and proposed service routing.
   1. Obtain Utility company approval of shop drawings prior to submittal.
E. Drawings prepared by Utility Company.
F. Project Record Documents: Record actual locations of equipment and installed service routing.

1.06 QUALITY ASSURANCE
A. Comply with the following:
   2. NFPA 70 (National Electrical Code).
   3. The requirements of the Utility Company.
   4. The requirements of the local authorities having jurisdiction.
B. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
C. Handle products carefully to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 ELECTRICAL SERVICE REQUIREMENTS
A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.
B. Electrical Service Characteristics: As indicated on drawings.
C. Utility Company: To be determined by Contractor. Coordinate with Owner and confirm with Engineer.
D. Division of Responsibility (before bid, confirm below with plans and utility standards and advise if discrepancy):
   1. Pad-Mounted Utility Transformers:
      a. Transformer Pads: Furnished and installed by Contractor per Utility Company requirements.
      b. Transformers: Furnished and installed by Utility Company.
      d. Transformer Protective Bollards: Furnished and installed by Contractor per Utility Company requirements.
      e. Primary:
         1) Trenching and Backfilling: Provided by Contractor.
         2) Conduits: Furnished and installed by Contractor.
         3) Conductors: Furnished and installed by Utility Company.
      f. Secondary:
         1) Trenching and Backfilling: Provided by Contractor.
         2) Conduits: Furnished and installed by Contractor.
         3) Conductors: Furnished and installed by Contractor (Service Point at transformer).
   2. Terminations at Service Point: Provided by contractor per utility company requirements.
   3. Metering Provisions:
a. Meter Bases: Furnished and installed by Contractor per Utility Company requirements.
b. Metering Transformer Cabinets: Furnished and installed by Contractor per Utility Company requirements.
d. Conduits Between Metering Transformers and Meters: Furnished and installed by Contractor per Utility Company requirements.
e. Wiring Between Metering Transformers and Meters: Furnished and installed by Utility Company.
f. Communications Conduits for Meters: Furnished and installed by Contractor per Utility Company requirements.

E. Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.
C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Verify and mark locations of existing underground utilities.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions and Utility Company requirements.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Arrange equipment to provide minimum clearances and required maintenance access.
D. Provide required trenching and backfilling in accordance with Section 31 2316 and Section 31 2323.
E. Construct cast-in-place concrete pads for utility equipment in accordance with Utility Company requirements and Section 03 3000.
F. Provide required protective bollards in accordance with Utility Company requirements.
G. Provide required support and attachment components in accordance with Section 26 0529.
H. Provide grounding and bonding for service entrance equipment in accordance with Section 26 0526.
I. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 26 0553.

3.04 PROTECTION

A. Protect installed equipment from subsequent construction operations.

END OF SECTION
SECTION 26 2416
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Power distribution panelboards.
B. Lighting and appliance panelboards.
C. Load centers.
D. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS
A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.
B. Section 26 0526 - Grounding and Bonding for Electrical Systems.
C. Section 26 0529 - Hangers and Supports for Electrical Systems.
D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
E. Section 26 0573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.
F. Section 26 2813 - Fuses: Fuses for fusible switches and spare fuse cabinets.
G. Section 26 4300 - Surge Protective Devices.

1.03 REFERENCE STANDARDS
A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision E, 2013.
B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2009.
D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
F. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.
G. NEMA PB 1 - Panelboards; 2011.
H. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.
J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
M. UL 67 - Panelboards; Current Edition, Including All Revisions.
N. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
   4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   5. Notify Architect & Building Systems Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Refer to Division 01 - Administrative Requirements, for submittal procedures. 
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
   1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

C. Schneider Electric; Square D Products: www.schneider-electric.us.
E. Substitutions: Refer to Division 01 - Product Requirements.
F. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.
B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
1. Altitude: Less than 6,600 feet (2,000 m).
2. Ambient Temperature:
   a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and
      104 degrees F (40 degrees C).

C. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault
      current at the installed location as determined by short circuit study performed in
      accordance with Section 26 0573.
   2. Listed series ratings are acceptable, except where not permitted by motor contribution
      according to NFPA 70.
   3. Label equipment utilizing series ratings as required by NFPA 70.

D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service
   equipment according to UL 869A.

E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each
      feeder or branch circuit requiring a neutral connection.
   2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for
      each feeder and branch circuit equipment grounding conductor.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the
      following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
   3. Fronts:
      a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
      b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough
         opening.
   4. Lockable Doors: All locks keyed alike unless otherwise indicated.

J. Future Provisions: Prepare all unused spaces for future installation of devices including
   bussing, connectors, mounting hardware and all other required provisions.

K. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices
   are provided in accordance with Section 26 4300, list and label panelboards as a complete
   assembly including surge protective device.

L. Panelboard Contactors: Where panelboard contactors are indicated, provide electrically
   operated, mechanically held magnetic contactor complying with NEMA ICS 2.
   1. Ampere Rating: Not less than ampere rating of panelboard bus.
   2. Short Circuit Current Rating: Not less than the panelboard short circuit current rating.
   3. Coil Voltage: As required for connection to control system indicated.

M. Provide the following features and accessories where indicated or where required to complete
   installation:
   1. Feed-through lugs.
   2. Sub-feed lugs.

2.03 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type,
   circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and
   features as indicated on the drawings.
B. Conductor Terminations:
   1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Main and Neutral Lug Type: Mechanical.
C. Bussing:
   1. Phase and Neutral Bus Material: Aluminum.
D. Circuit Breakers:
   1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.
E. Enclosures:
   1. Provide surface-mounted enclosures unless otherwise indicated.

2.04 LIGHTING AND APPLIANCE PANELBOARDS
A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
B. Conductor Terminations:
   1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Main and Neutral Lug Type: Mechanical.
C. Bussing:
D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
E. Enclosures:
   1. Provide surface-mounted or flush-mounted enclosures as indicated.
   2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
   3. Provide clear plastic circuit directory holder mounted on inside of door.

2.05 LOAD CENTERS
A. Description: Circuit breaker type load centers listed and labeled as complying with UL 67; ratings, configurations, and features as indicated on the drawings.
B. Bussing:
   2. Bus Material: Aluminum or copper.
C. Circuit Breakers: Thermal magnetic plug-in type.
D. Enclosures:
   1. Provide flush-mounted enclosures unless otherwise indicated.
   2. Fronts: Provide hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
   3. Provide circuit directory label on inside of door or individual circuit labels adjacent to circuit breakers.

2.06 OVERCURRENT PROTECTIVE DEVICES
A. Fusible Switches:
   1. Description: Quick-make, quick-break, dead-front fusible switch units complying with NEMA KS 1, and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated on the drawings.
2. Fuse Clips: As required to accept indicated fuses.
   a. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.

3. Provide externally operable handle with means for locking in the OFF position. Provide means for locking switch cover in the closed position. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

4. Conductor Terminations:
   a. Provide mechanical lugs unless otherwise indicated.
   b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

B. Molded Case Circuit Breakers:
1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

2. Interrupting Capacity:
   a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
   b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
   c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.

3. Conductor Terminations:
   a. Provide mechanical lugs unless otherwise indicated.
   b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
   a. Provide the following field-adjustable trip response settings:
      1) Long time pickup, adjustable by setting dial.
      2) Long time delay.
      3) Short time pickup and delay.
      4) Instantaneous pickup.


7. Provide the following circuit breaker types where indicated:
   a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
   b. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
   c. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
   d. Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.

8. Provide listed high intensity discharge lighting rated circuit breakers with HID marking for all branch circuits serving HID lighting.

9. Do not use handle ties in lieu of multi-pole circuit breakers.

10. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.

11. Provide the following features and accessories where indicated or where required to complete installation:
   a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
   b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.
PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that field measurements are as indicated.
   B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
   C. Verify that mounting surfaces are ready to receive panelboards.
   D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION
   A. Perform work in accordance with NECA 1 (general workmanship).
   B. Install products in accordance with manufacturer's instructions.
   C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
   D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
   E. Provide required support and attachment in accordance with Section 26 0529.
   F. Install panelboards plumb.
   G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
   H. Mount floor-mounted power distribution panelboards on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 03 3000.
   I. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
   J. Provide grounding and bonding in accordance with Section 26 0526.
      1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
   K. Install all field-installed branch devices, components, and accessories.
   L. Provide fuses complying with Section 26 2813 for fusible switches as indicated.
   M. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
   N. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26 0573.
   O. Provide filler plates to cover unused spaces in panelboards.
   P. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
      1. Emergency and night lighting circuits.
      2. Fire detection and alarm circuits.
      3. Communications equipment circuits.
      4. Video surveillance system circuits.
   Q. Identify panelboards in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL
   A. Refer to Division 01 - Quality Requirements, for additional requirements.
   B. Inspect and test in accordance with NETA ATS, except Section 4.
   C. Fusible Switches: Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
   D. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 50 amperes. Tests listed as optional are not required.
E. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
F. Test GFCI circuit breakers to verify proper operation.
G. Test AFCI circuit breakers to verify proper operation.
H. Test shunt trips to verify proper operation.
I. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.
J. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04ADJUSTING
A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
B. Adjust alignment of panelboard fronts.
C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.05CLEANING
A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION
SECTION 26 2726
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Wall switches.
B. Receptacles.
C. Wall plates.

1.02 RELATED REQUIREMENTS
A. Section 26 0533.16 - Boxes for Electrical Systems.
B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS
B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Federal Specification; Revision F, 1999.
C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R 2010).
F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2012.
G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

1.04 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.
B. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.05 DELIVERY, STORAGE, AND PROTECTION
A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS
A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
D. Provide tamper resistant receptacles for receptacles installed in dwelling units.
E. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.
F. Provide GFI protection for all receptacles installed in kitchens.
G. Provide GFCI protection for receptacles serving electric drinking fountains.
2.02 WIRING DEVICE FINISHES
   A. Finish selected by owner and architectural representative.

2.03 WALL SWITCHES
   A. Manufacturers:
   B. General Use Switches (only where specifically noted): AC only, quiet operating, general-use
      snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and
      listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the
      drawings.
      1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for
         back wiring with separate ground terminal screw.
   C. Accessible Wall Switches (all public and private exposed locations): Industrial specification
      grade, 20 A, 120/277 V with decorator style rocker type switch actuator and maintained
      contacts; single pole single throw, double pole single throw, three way, or four way as indicated
      on the drawings.
   D. Lighted Wall Switches: (Concealed locations and mechanical/electrical spaces); and Industrial
      specification grade, 20 A, 120/277 V with illuminated decorator style rocker type switch actuator
      and maintained contacts; illuminated with load off; single pole single throw, double pole single
      throw, three way, or four way as indicated on the drawings.
   E. Pilot Light Wall Switches: (for use with contactors) Industrial specification grade, 20 A, 120/277
      V with red illuminated standard toggle type switch actuator and maintained contacts and
      illuminated with load on. Provide single pole single throw, double pole single throw, three way,
      or four way as indicated on the drawings.
   F. Momentary Contact Wall Switches (for use with mechanically held contactors, door controllers,
      and where shown on plan): Industrial specification grade, 20 A, 120/277 V with toggle type three
      position switch actuator and momentary contacts; single pole double throw, off with switch
      actuator in center position.

2.04 RECEPTACLES
   A. Manufacturers:
      4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
      5. Source Limitations: Where wall controls are furnished as part of lighting control system,
         provide accessory matching receptacles and wallplates by the same manufacturer in
         locations indicated.
   B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA
      WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated
      on the drawings.
      1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for
         back wiring with separate ground terminal screw.
      2. NEMA configurations specified are according to NEMA WD 6.
      3. Hospital Grade Receptacles (healthcare locations): Listed as complying with UL 498
         Supplement SD, with green dot hospital grade mark on device face.
   C. Convenience Receptacles:
      1. Standard Convenience Receptacles (common areas): Industrial specification grade, 20A,
         125V, NEMA 5-20R; single or duplex as indicated on the drawings.
2. Tamper Resistant Convenience Receptacles (dwelling units): Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.

D. GFCI Receptacles:
   1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
   2. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

2.05 COMMUNICATIONS OUTLETS

A. Telephone Outlet:
   1. Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1 complying with Category 5e. Comply with UL 1863.
   2. Outlet color to be verified with owners IT personnel.

B. Data Outlet:
   1. Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1 complying with Category 5e. Comply with UL 1863.
   2. Outlet color to be verified with owners IT personnel.

C. TV Outlet:
   1. Type F coaxial cable connector.

D. Combination Outlet:
   1. Any combination of telephone, data, or television outlets as noted on plans. Provide in a common box with a common faceplate.

2.06 WALL PLATES

A. Manufacturers:
   5. Substitutions: Refer to Division 01 - Product Requirements.

B. Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Size: Standard; do not use oversized plates without architect approval.
   3. Screws: Metal with slotted heads finished to match wall plate finish.

C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

D. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

E. Wall plates shall be uniform in color, style and material within an area for all receptacle, switch and communications devices.

F. For wall mounted telephones (above 36" AFF), wall plate shall have telephone mounting studs.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
D. Verify that final surface finishes are complete, including painting.
E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION
A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of wiring devices provided under this section.
   1. Mounting Heights: As indicated on the drawings. If not indicated, install as follows:
      a. Wall Switches: box top 48 inches (1.2 m) above finished floor.
      b. Wall Dimmers: box top 48 inches (1.2 m) above finished floor.
      c. Receptacles: box bottom 18 inches (450 mm) above finished floor or 6 inches (150 mm) above counter.
   2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
   3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
   4. Locate wall switches on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect & Building Systems Engineer to obtain direction prior to proceeding with work.
   5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Provide GFI receptacles with integral GFI protection at each location indicated (exterior, isolated or remote locations). Do not use feed-through wiring to protect downstream devices.

I. Unless otherwise indicated, GFI receptacles may be connected to provide feed-through protection to downstream devices in immediate vicinity (same room). Label such devices to indicate they are protected by upstream GFI protection.

J. Install wiring devices plumb and level with mounting yoke held rigidly in place.

K. Install wall switches with OFF position down.

L. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

M. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

N. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
3.03 FIELD QUALITY CONTROL
A. Refer to Division 01 - Quality Requirements, for additional requirements.
B. Inspect each wiring device for damage and defects.
C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
D. Test each receptacle to verify operation and proper polarity.
E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.04 ADJUSTING
A. Adjust devices and wall plates to be flush and level.
B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Architect & Building Systems Engineer.

3.05 CLEANING
A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION
SECTION 26 2813
FUSES

PART 1 GENERAL

1.01 RELATED REQUIREMENTS
A. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.02 REFERENCE STANDARDS
A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.
B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
   2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
   3. Notify Architect & Building Systems Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.04 SUBMITTALS
A. Refer to Division 01 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.
   1. Spare Fuse Cabinet: Include dimensions.
C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Refer to Division 01 - Product Requirements, for additional provisions.
   2. Extra Fuses: One set(s) of three for each type and size installed.
   3. Fuse Pullers: One set(s) compatible with each type and size installed.
   4. Spare Fuse Cabinet Keys: Two.

1.05 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MANUFACTURERS
C. Substitutions: Refer to Division 01 - Product Requirements.

2.02 FUSES
A. Provide products listed, classified, and labeled as suitable for the purpose intended.
B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.
C. Provide fuses of the same type, rating, and manufacturer within the same switch.
D. Comply with UL 248-1.
E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.
F. Voltage Rating: Suitable for circuit voltage.
G. Class R Fuses: Comply with UL 248-12.
   1. Class RK1, Time-Delay Fuses.
   2. Class RK5, Time-Delay Fuses.
H. Provide the following accessories where indicated or where required to complete installation:
   1. Fuseholders: Compatible with indicated fuses.
   2. Fuse Reducers: For adapting indicated fuses to permit installation in switch designed for fuses with larger ampere ratings.

2.03 SPARE FUSE CABINET
A. Description: Wall-mounted sheet metal cabinet with shelves and hinged door with cylinder lock, suitably sized to store spare fuses and fuse pullers specified.
B. Finish: Manufacturer's standard, factory applied grey finish unless otherwise indicated.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.
B. Verify that mounting surfaces are ready to receive spare fuse cabinet.
C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION
A. Do not install fuses until circuits are ready to be energized.
B. Install fuses with label oriented such that manufacturer, type, and size are easily read.
C. Install spare fuse cabinet where indicated.
D. Identify spare fuse cabinet in accordance with Section 26 0553.

END OF SECTION
SECTION 26 2816.13
ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS
A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
B. Section 26 0529 - Hangers and Supports for Electrical Systems.

1.02 REFERENCE STANDARDS
A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision E, 2013.
B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. Coordinate work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted enclosed circuit breakers where indicated.
   4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   5. Notify Architect & Building Systems Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.04 SUBMITTALS
A. Refer to Division 01 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.
   1. Include characteristic trip curves for each type and rating of circuit breaker upon request.
C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Include dimensioned plan and elevation views of enclosed circuit breakers and adjacent equipment with all required clearances indicated.
2. Include wiring diagrams showing all factory and field connections.
3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

E. Project Record Documents: Record actual installed locations of enclosed circuit breakers.

F. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.05 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed circuit breaker internal components, enclosure, and finish.

1.07 FIELD CONDITIONS
A. Maintain ambient temperature between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed circuit breakers.

PART 2 PRODUCTS

2.01 MANUFACTURERS
C. Schneider Electric; Square D Products: www.schneider-electric.us.
D. Substitutions: Refer to Division 01 - Product Requirements.
E. Source Limitations: Furnish enclosed circuit breakers and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED CIRCUIT BREAKERS
A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

D. Short Circuit Current Rating:
   1. Provide enclosed circuit breakers with listed short circuit current rating not less than the available fault current at the installed location indicated on the drawings.
   2. Listed series ratings are acceptable, except where not permitted by motor contribution according to NFPA 70.
   3. Label equipment utilizing series ratings as required by NFPA 70.

E. Enclosed Circuit Breakers Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

F. Conductor Terminations: Suitable for use with the conductors to be installed.

G. Provide thermal magnetic circuit breakers unless otherwise indicated.
H. Provide electronic trip circuit breakers for circuit breaker frame sizes 225 amperes and above.

I. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

J. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.

K. Provide externally operable handle with means for locking in the OFF position.

L. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
   1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
   2. Where accessory ground fault sensing and relaying equipment is used, equip companion circuit breakers with ground-fault shunt trips.
      a. Use zero sequence ground fault detection method unless otherwise indicated.
      b. Provide test panel and field-adjustable ground fault pick-up and delay settings.
      c. Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control ground fault delay functions for system coordination purposes.

M. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

2.03 MOLDED CASE CIRCUIT BREAKERS

A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

B. Interrupting Capacity:
   1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      a. 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
   2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
   3. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.

C. Conductor Terminations:
   1. Provide mechanical lugs unless otherwise indicated.
   2. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

D. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   1. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
   2. Provide interchangeable trip units where indicated.

E. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
   1. Provide the following field-adjustable trip response settings:
      a. Long time pickup, adjustable by replacing interchangeable trip unit or by setting dial.
      b. Long time delay.
      c. Short time pickup and delay.
      d. Instantaneous pickup.
e. Ground fault pickup and delay where ground fault protection is indicated.

2. Provide zone selective interlocking capability where indicated, capable of communicating with other electronic trip circuit breakers and external ground fault sensing systems to control short time delay and ground fault delay functions for system coordination purposes.

3. Provide communication capability where indicated: Compatible with system indicated.

F. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

G. Provide the following circuit breaker types where indicated:
   1. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.

H. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.

I. Provide listed high intensity discharge lighting rated circuit breakers with HID marking for all branch circuits serving HID lighting.

J. Provide the following features and accessories where indicated or where required to complete installation:
   1. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.

PART 3  EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed circuit breakers are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed circuit breakers.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer’s instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer’s instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install enclosed circuit breakers plumb.

F. Install flush-mounted enclosed circuit breakers so that trims fit completely flush to wall with no gaps and rough opening completely covered.

G. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.

H. Provide grounding and bonding in accordance with Section 26 0526.

I. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

3.03 FIELD QUALITY CONTROL

A. Refer to Division 01 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with manufacturer’s instructions and NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for circuit breakers used for service entrance and for circuit breakers larger than 400 amperes. Tests listed as optional are not required.
   1. Perform insulation-resistance tests on all control wiring with respect to ground.
   2. Test functions of the trip unit by means of secondary injection.
D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
E. Test GFCI circuit breakers to verify proper operation.
F. Test shunt trips to verify proper operation.
G. Correct deficiencies and replace damaged or defective enclosed circuit breakers.

3.04 ADJUSTING
A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING
A. Clean dirt and debris from circuit breaker enclosures and components according to manufacturer's instructions.
B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION
SECTION 26 2816.16
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS
A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
B. Section 26 0529 - Hangers and Supports for Electrical Systems.
C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
D. Section 26 2813 - Fuses.

1.03 REFERENCE STANDARDS
A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.
E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   4. Notify Architect & Building Systems Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS
A. Refer to Division 01 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.
D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

E. Project Record Documents: Record actual locations of enclosed switches.

F. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Refer to Division 01 - Product Requirements, for additional provisions.
   2. See Section 26 2813 for requirements for spare fuses and spare fuse cabinets.

1.06 QUALITY ASSURANCE
   A. Conform to requirements of NFPA 70.
   B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING
   A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
   B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

PART 2 PRODUCTS
2.01 MANUFACTURERS
   C. Schneider Electric; Square D Products: www.schneider-electric.us.
   E. Substitutions: Refer to Division 01 - Product Requirements.
   F. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED SAFETY SWITCHES
   A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
   B. Provide products listed, classified, and labeled as suitable for the purpose intended.
   C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
      1. Altitude: Less than 6,600 feet (2,000 m).
      2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).
   D. Horsepower Rating: Suitable for connected load.
   E. Voltage Rating: Suitable for circuit voltage.
   F. Short Circuit Current Rating:
      1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
      2. Minimum Ratings:
         a. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.
G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

H. Provide with switch blade contact position that is visible when the cover is open.

I. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
   1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.

J. Conductor Terminations: Suitable for use with the conductors to be installed.

K. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

L. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

M. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Finish for Painted Steel Enclosures: Where exposed, color as selected by architect unless otherwise indicated.

N. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

O. Heavy Duty Switches:
   2. Conductor Terminations:
      a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
      b. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

P. Provide the following features and accessories where indicated or where required to complete installation:
   1. Hubs: As required for environment type; sized to accept conduits to be installed.
   2. Integral fuse pullers.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

D. Verify that conditions are satisfactory for installation prior to starting work.

**3.02 INSTALLATION**

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 0526.
H. Provide fuses complying with Section 26 2813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.
I. Identify enclosed switches in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL
A. Refer to Division 01 - Quality Requirements, for additional requirements.
B. Inspect and test in accordance with NETA ATS, except Section 4.
C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING
A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING
A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
B. Repair scratched or marred exterior surfaces to match original factory finish. Where exposed to view, subcontract GC to paint (before mounting) to match adjacent finish.

END OF SECTION
SECTION 26 4300
SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Surge protective devices for service entrance locations.

1.02 RELATED REQUIREMENTS
A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

1.03 REFERENCE STANDARDS
A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.01 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS
A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.
B. UL 1449 Voltage Protection Ratings (VPRs).
   1. 240/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.
C. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.
D. Enclosure Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations.

2.02 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS
A. Unless otherwise indicated, provide field-installed, externally mounted SPDs.
B. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.
C. Provide SPDs utilizing only field-replaceable modular protection circuits.
D. Surge Current Rating: Not less than 120 kA per mode/240 kA per phase.
E. UL 1449 Nominal Discharge Current (I-n): 20 kA.
F. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
G. Diagnostics:
   1. Protection Status Monitoring: Provide indicator lights to report the protection for each phase.

PART 3 EXECUTION

3.01 INSTALLATION
A. Perform work in accordance with NECA 1 (general workmanship).
B. Install products in accordance with manufacturer's instructions.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide conductors with minimum ampacity as indicated on the drawings, as required by NFPA 70, and not less than manufacturer's recommended minimum conductor size.

E. Install conductors between SPD and equipment terminations as short and straight as possible, not exceeding manufacturer's recommended maximum conductor length. Breaker locations may be reasonably rearranged in order to provide leads as short and straight as possible. Twist conductors together to reduce inductance.

F. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 26 0526 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Interior luminaires.
   B. Emergency lighting units.
   C. Exit signs.
   D. Ballasts and drivers.
   E. Lamps.
   F. Luminaire accessories.

1.02 RELATED REQUIREMENTS
   A. Section 26 0533.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS
   B. ANSI C82.4 - American National Standard for Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type); 2002.
   D. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Cor 1, 2012).
   G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
   J. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.
   K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
   N. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.
   P. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS
   A. Coordination:
      1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify Architect & Building Systems Engineer of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS
A. Refer to Division 01 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.

1.06 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.
B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND PROTECTION
A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS
A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY
A. Refer to Division 01 - Closeout Submittals, for additional warranty requirements.
B. Provide three year manufacturer warranty for all LED luminaires, including drivers.
C. Provide two year manufacturer warranty for all linear fluorescent ballasts.
D. Provide five year pro-rata warranty for batteries for emergency lighting units.
E. Provide ten year pro-rata warranty for batteries for self-powered exit signs.
F. Provide three year full warranty for fluorescent emergency power supply units.

PART 2 PRODUCTS
2.01 LUMINAIRE TYPES
A. Furnish products as indicated in luminaire schedule included on the drawings.
B. Substitutions: Refer to Division 01 - Product Requirements, except where individual luminaire types are designated with substitutions not permitted.

2.02 LUMINAires
A. Manufacturers:
   2. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com/#sle.
5. Progress.
6. Substitutions: Refer to Division 01 - Product Requirements.

B. Provide products that comply with requirements of NFPA 70.
C. Provide products that are listed and labeled as complying with UL 1598, where applicable.
D. Provide products listed, classified, and labeled as suitable for the purpose intended.
E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
H. Provide (1) extra of each type Common area and resident fixtures.
I. Recessed Luminaires:
   2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
   3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.
J. Fluorescent Luminaires:
   1. Provide ballast disconnecting means complying with NFPA 70 where required.
   2. Fluorescent Luminaires Controlled by Occupancy Sensors: Provide programmed start ballasts.
   3. Fluorescent Luminaires Controlled by Dual-Level Switching: Provide with two ballasts.
K. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
L. LED Luminaire Components: UL 8750 recognized or listed as applicable.
M. Track Lighting Systems: Provide track compatible with specified track heads, with all connectors, power feed fittings, dead ends, hangers and canopies as necessary to complete installation.
N. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.03 EMERGENCY LIGHTING UNITS

A. Manufacturers:
   4. Substitutions: Refer to Division 01 - Product Requirements.
B. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
C. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
D. Battery:
1. Size battery to supply all connected lamps, including emergency remote heads where indicated.

E. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

F. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.04 EXIT SIGNS

A. Description: Exit signs and similar signs for special purpose applications such as area of refuge/rescue assistance.

B. Description: Internally illuminated exit signs with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single or double as indicated or as required for the installed location.
   2. Directional Arrows: As indicated or as required for the installed location.

2.05 BALLASTS AND DRIVERS

A. Ballasts/Drivers - General Requirements:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

B. Fluorescent Ballasts:
   1. All Fluorescent Ballasts: Unless otherwise indicated, provide high frequency electronic ballasts complying with ANSI C82.11 and listed and labeled as complying with UL 935.
      a. Input Voltage: Suitable for operation at voltage of connected source, with variation tolerance of plus or minus 10 percent.
      b. Total Harmonic Distortion: Not greater than 20 percent.
      c. Power Factor: Not less than 0.95.
      d. Ballast Factor: Normal ballast factor between 0.85 and 1.15, unless otherwise indicated.
      e. Thermal Protection: Listed and labeled as UL Class P, with automatic reset for integral thermal protectors.
      f. Sound Rating: Class A, suitable for average ambient noise level of 20 to 24 decibels.
      g. Lamp Compatibility: Specifically designed for use with the specified lamp, with no visible flicker.
      h. Lamp Operating Frequency: Greater than 20 kHz, except as specified below.
      i. Lamp Current Crest Factor: Not greater than 1.7.
      j. Provide automatic restart capability to restart replaced lamp(s) without requiring resetting of power.
      k. Provide end of lamp life automatic shut down circuitry for T5 and smaller diameter lamp ballasts.
      l. Surge Tolerance: Capable of withstanding characteristic surges according to IEEE C62.41.2, location category A.
      m. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class A, non-consumer application.
      n. Ballast Marking: Include wiring diagrams with lamp connections.
   2. Non-Dimming Fluorescent Ballasts:
      a. Lamp Starting Method:
         1) T8 Lamp Ballasts: Instant start unless otherwise indicated.
         2) T5 Lamp Ballasts: Programmed start unless otherwise indicated.
         3) Compact Fluorescent Lamp Ballasts: Programmed start unless otherwise indicated.
      b. Lamp Starting Temperature: Capable of starting standard lamp(s) at a minimum of 0 degrees F (-18 degrees C), and energy saving lamp(s) at a minimum of 60 degrees F (16 degrees C) unless otherwise indicated.
C. High Intensity Discharge (HID) Ballasts: Complying with ANSI C82.4 and listed and labeled as complying with UL 1029.
   1. Electronic Metal Halide Ballasts:
      a. All Electronic Metal Halide Ballasts:
         1) Input Voltage: Suitable for operation at voltage of connected source, with variation tolerance of plus or minus 10 percent.
         2) Total Harmonic Distortion: Not greater than 15 percent.
         3) Power Factor: Not less than 0.90.
         4) Provide thermal protection with automatic reset.
         5) Sound Rating: Class A, suitable for average ambient noise level of 20 to 24 decibels.
         6) Lamp Operating Frequency: Less than 200 Hz or as required to avoid acoustic resonance in lamp arc tube.
         7) Lamp Current Crest Factor: Not greater than 1.5.
         8) Lamp Starting Temperature: Capable of starting standard lamp(s) at a minimum of -22 degrees F (-30 degrees C).
         9) Provide end of lamp life automatic shut down circuitry.
         10) Surge Tolerance: Capable of withstanding characteristic surges according to IEEE C62.41.2, location category A.

2.06 LAMPS

A. Manufacturers:
   4. Substitutions: Refer to Division 01 - Product Requirements.

B. Lamps - General Requirements:
   1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
   2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
   3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
   4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect & Building Systems Engineer to be inconsistent in perceived color temperature.
   5. Provide (1) box (6) lamps/bulbs of each type.

C. Lamps - Sustainable Design Requirements:
   1. Maximum Mercury Content:
      a. T8 Linear Fluorescent, 96 Inch: 10 mg.
      b. T8 Linear Fluorescent, 48 Inch: 3.5 mg.
      c. T8 Linear Fluorescent, 36 Inch and 24 Inch: 3.5 mg.
      d. T8 Linear Fluorescent, U-Bent: 6 mg.
      e. T5 Linear Fluorescent: 2.5 mg.
      f. T5 Circular Fluorescent: 9 mg.
      g. Compact Fluorescent, Nonintegral Ballast: 3.5 mg.
      h. Compact Fluorescent, Integral Ballast: 3.5 mg (ENERGY STAR qualified).
      i. High Pressure Sodium, Up to 400 W: 10 mg.
      j. High Pressure Sodium, Greater Than 400 W: 32 mg.
   2. Minimum Rated Lamp Life:
a. T8 Linear Fluorescent, 96 Inch: 24,000 hours for standard output lamps on instant start ballasts; 18,000 hours for high output lamps on instant start or programmed start ballasts; based on three hours per start.
b. T8 Linear Fluorescent, 48 Inch: 30,000 hours for standard and high output lamps on instant start ballasts; 36,000 hours on programmed start ballasts; based on three hours per start.
c. T8 Linear Fluorescent, 36 Inch and 24 Inch: 24,000 hours on instant start or programmed start ballasts; based on three hours per start.
d. T8 Linear Fluorescent, U-Bent: 18,000 hours on instant start ballasts; 24,000 hours on programmed start ballasts; based on three hours per start.
e. T5 Linear Fluorescent: 25,000 hours for standard and high output lamps on programmed start ballasts.
f. T5 Circular Fluorescent: 25,000 hours for standard and high output lamps on programmed start ballasts.
g. Compact Fluorescent, Nonintegral Ballast: 12,000 hours.
h. Compact Fluorescent, Integral Ballast: 10,000 hours for bare bulbs; 8,000 hours for covered models such as globes, reflectors, and A-19 lamps.
i. High Pressure Sodium: Use only non-cycling type lamps.

D. Incandescent Lamps: Wattage and bulb type as indicated, with base type as required for lighting fixture.
   1. Reflector Type Incandescent Lamps: Beam pattern as indicated.
   2. Non-Reflector Type Incandescent Lamps: Inside frosted lamp finish unless otherwise indicated.

E. Compact Fluorescent Lamps: Wattage and bulb type as indicated, with base type as required for luminaire.
   1. Low Mercury Content: Provide lamps that pass the EPA Toxicity Characteristic Leaching Procedure (TCLP) test for characteristic hazardous waste.
   2. Correlated Color Temperature (CCT): 3,500 K unless otherwise indicated.
   3. Color Rendering Index (CRI): Not less than 80.
   4. Average Rated Life: Not less than 10,000 hours for an operating cycle of three hours per start.

F. Linear Fluorescent Lamps: Wattage and bulb type as indicated, with base type as required for luminaire.
   1. Low Mercury Content: Provide lamps that pass the EPA Toxicity Characteristic Leaching Procedure (TCLP) test for characteristic hazardous waste.
   2. T8 Linear Fluorescent Lamps:
      a. Correlated Color Temperature (CCT): 3,500 K unless otherwise indicated.
      b. Color Rendering Index (CRI): Not less than 80.
      c. Average Rated Life: Not less than 20,000 hours for an operating cycle of three hours per start.
   3. T5 Linear Fluorescent Lamps:
      a. Correlated Color Temperature (CCT): 3,500 K unless otherwise indicated.
      b. Color Rendering Index (CRI): Not less than 80.
      c. Average Rated Life: Not less than 20,000 hours for an operating cycle of three hours per start.

G. High Intensity Discharge (HID) Lamps: Wattage as indicated, with bulb type, burning position, and base type as required for luminaire.
   1. Metal Halide Lamps:
      a. Non-Reflector Type Metal Halide Lamps: Phosphor coated lamp finish unless otherwise indicated.
      b. Provide ANSI type O-rated protected metal halide lamps where required for open luminaires provided with compatible exclusionary sockets.
      c. Ceramic Metal Halide Lamps:
         1) Correlated Color Temperature (CCT): 3,000 K unless otherwise indicated.
2) Color Rendering Index (CRI): Not less than 80.

H. LED (Light Emitting Diode) Lamps
   1. Correlated Color Temperature (CCT): 3,000 K unless otherwise indicated.
   2. Color Rendering Index (CRI): Not less than 80.
   3. Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that field measurements are as indicated.
   B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
   C. Verify that suitable support frames are installed where required.
   D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
   E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION
   A. Provide extension rings to bring outlet boxes flush with finished surface.
   B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION
   A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.
   B. Perform work in accordance with NECA 1 (general workmanship).
   C. Install products in accordance with manufacturer's instructions.
   D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
   E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
   F. Suspended Ceiling Mounted Luminaires:
      1. Do not use ceiling tiles to bear weight of luminaires.
      2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
      3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
      4. Secure pendant-mounted luminaires to building structure.
      5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
      6. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.
   G. Recessed Luminaires:
      1. Install trims tight to mounting surface with no visible light leakage.
      2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
      3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
   H. Suspended Luminaires:
      1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
      2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet (1.2 m) between supports.
4. Install canopies tight to mounting surface.
5. Unless otherwise indicated, support pendants from swivel hangers.

I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

J. Bond products and metal accessories to branch circuit equipment grounding conductor.

K. Fluorescent Luminaires Controlled by Dual-Level Switching: Connect such that each switch controls the same corresponding lamps in each luminaire.

L. Emergency Lighting Units:
   1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
   2. For every 10 fixtures installed, include 1 spare fixture with wiring and installation labor.
   3. Install lock-on device on branch circuit breaker serving units.

N. Exit Signs:
   1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
   2. For every 10 fixtures installed, include 1 spare fixture with wiring and installation labor.
   3. Install lock-on device on branch circuit breaker serving units.

O. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL
A. Refer to Division 01 - Quality Requirements, for additional requirements.
B. Inspect each product for damage and defects.
C. Operate each luminaire after installation and connection to verify proper operation.
D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.
E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect & Building Systems Engineer.

3.05 ADJUSTING
A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect & Building Systems Engineer. Secure locking fittings in place.
B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect & Building Systems Engineer or authority having jurisdiction.
C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect & Building Systems Engineer or authority having jurisdiction.

3.06 CLEANING
A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES
A. Refer to Division 01 - Closeout Submittals, for closeout submittals.
B. Refer to Division 01 - Demonstration and Training, for additional requirements.
C. Demonstration: Demonstrate proper operation of luminaires to Architect & Building Systems Engineer, and correct deficiencies or make adjustments as directed.

D. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Exterior luminaires.
   B. Ballasts.
   C. Lamps.
   D. Poles and accessories.
   E. Luminaire accessories.

1.02 RELATED REQUIREMENTS
   A. Section 03 3000 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.
   B. Section 26 0526 - Grounding and Bonding for Electrical Systems.
   C. Section 26 0533.16 - Boxes for Electrical Systems.
   D. Section 26 2726 - Wiring Devices: Receptacles for installation in poles.
   E. Section 26 2813 - Fuses.

1.03 REFERENCE STANDARDS
   F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
   H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
   I. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS
   A. Coordination:
      1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
      2. Notify Architect & Building Systems Engineer of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS
   A. Refer to Division 01 - Administrative Requirements, for submittal procedures.
   B. Shop Drawings:
1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
2. Provide photometric calculations where luminaires are proposed for substitution.
3. Provide structural calculations for each pole proposed for substitution.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
      b. Include IES LM-79 test report upon request.
   2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.
   3. Lamps: Include rated life and initial and mean lumen output.
   4. Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.

D. Sustainable Design Documentation: Submit manufacturer's product data on lamp mercury content and rated lamp life, showing compliance with specified requirements.

E. Samples:
   1. Provide one sample(s) of each luminaire proposed for substitution upon request.
   2. Provide one sample of each product finish illustrating color and texture upon request.

F. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria.

G. Field Quality Control Reports.
   1. Include test report indicating measured illumination levels.

H. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

I. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Refer to Division 01 - Product Requirements, for additional provisions.
   2. Extra Lamps: Ten percent of total quantity installed for each type, but not less than two of each type.
   3. Extra Ballasts: Two percent of total quantity installed for each type, but not less than one of each type.
   4. Extra Fuses: Five percent of total quantity installed for each type, but not less than two of each type.
   5. Touch-Up Paint: 2 gallons (8 liters), to match color of pole finish.

K. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

1.06 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.
1.08 WARRANTY
A. Refer to Division 01 - Closeout Submittals, for additional warranty requirements.
B. Provide three year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS
2.01 MANUFACTURERS
B. Cooper Lighting, a division of Cooper Industries: www.cooperindustries.com.
D. Progress Lighting.

2.02 LUMINAIRE TYPES
A. Furnish products as indicated in luminaire schedule included on the drawings.
B. Substitutions: Refer to Division 01 - Product Requirements.

2.03 LUMINAIRES
A. Provide products that comply with requirements of NFPA 70.
B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
C. Provide products listed, classified, and labeled as suitable for the purpose intended.
D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.
H. HID Luminaires:
   1. HID High Bay Luminaires: Provide safety chain or power hook unless otherwise indicated.
   2. HID Luminaires with Quartz Restrike Systems: Factory-installed supplementary quartz lamp automatically switches on when power interruption causes primary HID lamp to drop out or during cold startup.
I. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
J. LED Luminaire Components: UL 8750 recognized or listed as applicable.
K. Exposed Hardware: Stainless steel.

2.04 BALLASTS
A. Ballasts/Drivers - General Requirements:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

2.05 LAMPS
A. Manufacturers:
4. Substitutions: Refer to Division 01 - Product Requirements.
5. Manufacturer Limitations: Where possible, provide lamps produced by a single manufacturer.
6. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.

B. Lamps - General Requirements:
1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect & Building Systems Engineer to be inconsistent in perceived color temperature.

C. High Intensity Discharge (HID) Lamps: Wattage as indicated, with bulb type, burning position, and base type as required for luminaire.
1. Metal Halide Lamps:
   a. Non-Reflector Type Metal Halide Lamps: Clear lamp finish unless otherwise indicated.
   b. Provide ANSI type O-rated protected metal halide lamps where required for open luminaires provided with compatible exclusionary sockets.
   c. Ceramic Metal Halide Lamps:
      1) Correlated Color Temperature (CCT): 3,000 K unless otherwise indicated.
      2) Color Rendering Index (CRI): Not less than 80.

2.06 POLES

A. All Poles:
1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
2. Structural Design Criteria:
   a. Comply with AASHTO LTS.
   b. Wind Load: Include effective projected area (EPA) of luminaire(s) and associated supports and accessories to be installed.
      1) Design Wind Speed: 110 miles per hour (______ kph), with gust factor of 1.3.
   c. Dead Load: Include weight of proposed luminaire(s) and associated supports and accessories.
   d. Include structural calculations demonstrating compliance with submittals.
3. Material: Steel, unless otherwise indicated.
4. Shape: Square straight, unless otherwise indicated.
5. Finish: Match luminaire finish, unless otherwise indicated.
7. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.
8. Unless otherwise indicated, provide with the following features/accessories:
   a. Top cap.
   b. Handhole, 2"w x 6"h size.
   c. Anchor bolts with leveling nuts or leveling shims.
   d. Anchor base cover.
   e. Provision for pole-mounted weatherproof GFI receptacle where indicated.
   f. Hinged base.
   g. Pole-top tenon, size as required for installed luminaire or bracket.
2.07 ACCESSORIES

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
C. Verify that suitable support frames are installed where required.
D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.
B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Install products in accordance with manufacturer's instructions.
D. Install luminaires in accordance with NECA/IESNA 501.
E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
F. Recessed Luminaires:
   1. Install trims tight to mounting surface with no visible light leakage.
G. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
H. Pole-Mounted Luminaires:
   1. Maintain the following minimum clearances:
      b. Comply with utility company requirements.
   2. Foundation-Mounted Poles:
      a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 03 3000.
         1) Install anchor bolts plumb per template furnished by pole manufacturer.
         2) Position conduits to enter pole shaft.
      b. Install foundations plumb.
      c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
      d. Tighten anchor bolt nuts to manufacturer's recommended torque.
      e. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.
      f. Install anchor base covers or anchor bolt covers as indicated.
   3. Embedded Poles: Install poles plumb as indicated.
4. Grounding:
   a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
   b. Provide supplementary ground rod electrode as specified in Section 26 0526 at each pole bonded to grounding system as indicated.
5. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.
6. Install breakaway in-line fuse holders and fuses complying with Section 26 2813 in pole handhole or transformer base for each ungrounded conductor.
7. Install weather resistant GFI duplex receptacle with weatherproof cover as specified in Section 26 2726 in designated poles.
I. Install accessories furnished with each luminaire.
J. Bond products and metal accessories to branch circuit equipment grounding conductor.
K. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL
A. Refer to Division 01 - Quality Requirements, for additional requirements.
B. Inspect each product for damage and defects.
C. Operate each luminaire after installation and connection to verify proper operation.
D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect & Building Systems Engineer.
E. Measure illumination levels at night with calibrated meters to verify conformance with performance requirements. Record test results in written report to be included with submittals.

3.05 ADJUSTING
A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect & Building Systems Engineer. Secure locking fittings in place.
B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Architect & Building Systems Engineer.

3.06 CLEANING
A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES
A. Refer to Division 01 - Closeout Submittals, for closeout submittals.
B. Refer to Division 01 - Demonstration and Training, for additional requirements.
C. Demonstration: Demonstrate proper operation of luminaires to Architect & Building Systems Engineer, and correct deficiencies or make adjustments as directed.
D. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION
A. Protect installed luminaires from subsequent construction operations.

END OF SECTION
SECTION 27 1000
STRUCTURED CABLING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Communications system design requirements.
B. Communications pathways.
C. Copper cable and terminations.
D. Communications equipment room fittings.
E. Communications outlets.
F. Communications identification.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.
B. Section 26 0533.13 - Conduit for Electrical Systems.
C. Section 26 0533.16 - Boxes for Electrical Systems.
D. Section 26 2726 - Wiring Devices.

1.03 REFERENCE STANDARDS

A. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; Electronic Industries Alliance/Electrical Components Association; Revision E, 2005.
C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
E. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2009c, with Addendum (2016).
F. TIA-569 - Telecommunications Pathways and Spaces; 2015d, with Addendum (2016).
G. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2017c.
I. UL 444 - Communications Cables; Current Edition, Including All Revisions.
K. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Refer to Division 01 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
C. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
D. Evidence of qualifications for installer.
E. Field Test Reports.
F. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
   1. Record actual locations of outlet boxes and distribution frames.
   2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
   3. Identify distribution frames and equipment rooms by room number on contract drawings.

G. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

1.05 QUALITY ASSURANCE

1.06 DELIVERY, STORAGE, AND HANDLING
   A. Store products in manufacturer's unopened packaging until ready for installation.
   B. Keep stored products clean and dry.

1.07 WARRANTY
   A. Refer to Division 01 - Closeout Submittals, for additional warranty requirements.
   B. Correct defective Work within a 2 year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 SYSTEM DESIGN
   A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
      1. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
      2. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F (0 to 60 degrees C) at relative humidity of 0 to 95 percent, noncondensing.
      3. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.
   B. System Description:
      1. Building Entrance Cable: Copper, 100-pair.
      2. Offices and Work Areas: Provide one voice outlet and one data outlet in each work area minimum. Refer to plans for locations and additional requirements.
   C. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.
      1. Locate main distribution frame as indicated on the drawings.
      2. Capacity: As required to terminate all cables required by design criteria plus minimum 25 percent spare space.
   D. Intermediate Distribution Frames (IDF): Support structures for terminating horizontal cables that extend to telecommunications outlets.
      1. Locate intermediate distribution frames as indicated on the drawings.
   E. Backbone Cabling: Cabling, pathways, and terminal hardware connecting intermediate distribution frames (IDF's) with main distribution frame (MDF), wired in star topology with main distribution frame at center hub of star.
   F. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.02 PATHWAYS
   A. Conduit: As specified in Section 26 0533.13; provide pull cords in all conduit.

2.03 COPPER CABLE AND TERMINATIONS
   A. Copper Horizontal Cable:
1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
2. Cable Type - Voice and Data: TIA-568-C.2 Category 5e UTP (unshielded twisted pair); 24 AWG.
3. Cable Capacity: 4-pair.
4. Cable Applications:
   a. Riser Applications: Use listed NFPA 70 Type CMR riser cable or Type CMP plenum cable.
   b. General Purpose Applications: Use listed NFPA 70 Type CM/CMG general purpose cable, Type CMR riser cable, or Type CMP plenum cable.
5. Cable Jacket Color - Data Cable: Blue.

B. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

C. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
   1. Performance: 500 mating cycles.
   2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.

2.04 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Copper Cross-Connection Equipment:
   1. Connector Blocks for Category 5e and Up Cabling: Type 110 insulation displacement connectors; capacity sufficient for cables to be terminated plus 25 percent spare.
   2. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
      a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
      b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
      c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
      d. Provide incoming cable strain relief and routing guides on back of panel.

B. Backboards: Interior grade plywood without voids, 3/4 inch (19 mm) thick; UL-labeled fire-retardant.
   1. Do not paint over UL label.

C. Equipment Racks and Cabinets: EIA/ECA-310 standard 19 inch (482.6 mm) wide component racks.
   1. Wall Mounted Racks: Steel construction, hinged to allow access to back of installed components.
   2. Wall Mounted Cabinets: Front doors with locks, louvered side panels, top and bottom cable access, and ground lug.
   3. Cabinets: Steel construction with corrosion resistant finish.
   4. Locks: Keyed alike.

2.05 COMMUNICATIONS OUTLETS

A. Outlet Boxes: Comply with Section 26 0533.16.
   1. Provide depth as required to accommodate cable manufacturer’s recommended minimum conductor bend radius.

B. Wall Plates:
   1. Comply with system design standards and UL 514C.
   2. Accepts modular jacks/inserts.
   3. Capacity:
a. Voice Only Outlets: 2 ports.
b. Data or Combination Voice/Data Outlets: 4 ports.

4. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified in Section 26 2726. All line and low voltage device and wall plate color and finish shall match within each area.

2.06 IDENTIFICATION PRODUCTS
A. Comply with TIA-606.

2.07 SOURCE QUALITY CONTROL
A. Refer to Division 01 - Quality Requirements, for additional requirements.
B. Factory test cables according to TIA-568 (SET).

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL
A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), NECA/BICSI 568, NFPA 70, and SYSTEM DESIGN as specified in PART 2.
B. Comply with Communication Service Provider requirements.
C. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.
D. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

3.02 INSTALLATION OF PATHWAYS
A. Install pathways with the following minimum clearances:
   1. 48 inches (1220 mm) from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
   2. 12 inches (300 mm) from power conduits and cables and panelboards.
   3. 5 inches (125 mm) from fluorescent and high frequency lighting fixtures.
   4. 6 inches (150 mm) from flues, hot water pipes, and steam pipes.
B. Conduit, in Addition to Requirements of Section 26 0533.13:
C. Outlet Boxes:
   1. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of telecommunications outlets provided under this section.
      a. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
      b. Provide minimum of 24 inches (600 mm) horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.
      c. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.

3.03 INSTALLATION OF EQUIPMENT AND CABLELING
A. Cabling:
   1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
   2. Do not over-cinch or crush cables.
   3. Do not exceed manufacturer's recommended cable pull tension.
   4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.
B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
   1. At Distribution Frames: 120 inches (3000 mm).
   2. At Outlets - Copper: 12 inches (305 mm).
   3. At Outlets - Optical Fiber: 39 inches (1000 mm).
C. Copper Cabling:
   1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch (12 mm) from point of termination.
   2. For 4-pair cables in conduit, do not exceed 25 pounds (110 N) pull tension.
   3. Use T568B wiring configuration.

D. Wall-Mounted Racks and Enclosures:
   1. Install to plywood backboards only, unless otherwise indicated.
   2. Mount so height of topmost panel does not exceed 78 inches (1980 mm) above floor.

E. Identification:
   1. Use wire and cable markers to identify cables at each end.
   2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
   3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

3.04 FIELD QUALITY CONTROL

A. Refer to Division 01 - Quality Requirements, for additional requirements.

B. Comply with inspection and testing requirements of specified installation standards.

C. Visual Inspection:
   1. Inspect cable jackets for certification markings.
   2. Inspect cable terminations for color coded labels of proper type.
   3. Inspect outlet plates and patch panels for complete labels.

D. Testing - Copper Cabling and Associated Equipment:
   1. Test operation of shorting bars in connection blocks.
   2. Category 5e and Above Backbone: Perform near end cross talk (NEXT) and attenuation tests.
   3. Category 5e and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.

E. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION
SECTION 28 0513
CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

PART 1  GENERAL

1.01  SUMMARY

A. Section Includes:
   1. UTP cabling.
   2. Coaxial cabling.
   3. RS-232 cabling.
   4. RS-485 cabling.
   5. Low-voltage control cabling.
   7. Fire alarm wire and cable.
   8. Identification products.

1.02  DEFINITIONS

B. EMI: Electromagnetic interference.
C. IDC: Insulation displacement connector.
D. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).
E. RCDD: Registered Communications Distribution Designer.

1.03  SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements.
C. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.
D. Source quality-control reports.
E. Field quality-control reports.
F. Operation and maintenance data.

1.04  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.
B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 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: 450 or less.
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.

1.05  DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.
   1. Test each pair of UTP cable for open and short circuits.

1.06  PROJECT CONDITIONS

A. Do not install conductors and cables that are wet, moisture damaged, or mold damaged.
   1. Indications that wire and cables are wet or moisture damaged include, but are not limited to, discoloration and sagging of factory packing materials.
B. Environmental Limitations: Do not deliver or install UTP, optical fiber, and coaxial cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 PRODUCTS

2.01 PATHWAYS

A. Support of Open Cabling: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

B. Conduit and Boxes: Comply with requirements in Division 26 Section “Raceway and Boxes for Electrical Systems.”
   1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

2.02 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels in Division 06 Section “Rough Carpentry”.

2.03 UTP CABLE

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. ADC.
   2. AMP Netconnect; a brand of Tyco Electronics Corporation.
   3. Belden CDT Networking Division/NORDX.
   4. Belden Inc.
   5. Berk-Tek; a Nexans company.
   6. CommScope, Inc.
   7. Draka Cableteq USA.
   8. Genesis Cable Products; Honeywell International, Inc.
   9. Mohawk; a division of Belden.
   10. Superior Essex Inc.
   11. SYSTIMAX Solutions; a CommScope, Inc. brand.
   12. 3M; Communication Markets Division.

B. Description: 100-ohm, 4-pair UTP, covered with a blue thermoplastic jacket.
   1. Comply with ICEA S-90-661 for mechanical properties.
   2. Comply with TIA/EIA-568-B.1 for performance specifications.

2.04 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. ADC.
   3. AMP Netconnect; a brand of Tyco Electronics Corporation.
   4. Belden CDT Networking Division/NORDX.
   5. Dynacom Corporation.
   6. Hubbell Incorporated; Hubbell Premise Wiring.
   7. Leviton Voice & Data Division.
   8. Molex Premise Networks; a division of Molex, Inc.
   9. PANDUIT CORP.
   10. Siemon.

B. 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.
C. 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.

2.05 COAXIAL CABLE
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. Alpha Wire Company.
2. Belden CDT Networking Division/NORDX.
3. Coleman Cable, Inc.
4. CommScope, Inc.
5. Draka Cableteq USA.
B. General Coaxial Cable Requirements: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz.
C. RG-11/U: NFPA 70, Type CATV.
1. No. 14 AWG, solid, copper-covered steel conductor.
2. Gas-injected, foam-PE insulation.
3. Double shielded with 100 percent aluminum polyester tape and 60 percent aluminum braid.
4. Jacketed with sunlight-resistant, black PVC or PE.
5. Suitable for outdoor installations in ambient temperatures ranging from minus 40 to plus 85 deg C.
D. RG-6/U: NFPA 70, Type CATV or CM.
1. No. 16 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Double shielded with 100 percent aluminum-foil shield and 60 percent aluminum braid.
3. Jacketed with black PVC or PE.
4. Suitable for indoor installations.
E. NFPA and UL Compliance: CATV Cable, Type CATV shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655, and with NFPA 70 "Radio and Television Equipment" and "Community Antenna Television and Radio Distribution" Articles.

2.06 COAXIAL CABLE HARDWARE
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. Emerson Network Power Connectivity Solutions; AIM Electronics brand.
2. Leviton Voice & Data Division.
3. Siemon.
B. Coaxial-Cable Connectors: Type BNC, 75 ohms.

2.07 RS-232 CABLE
A. Standard Cable: NFPA 70, Type CM.
1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Polypropylene insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. PVC jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
B. Plenum-Rated Cable: NFPA 70, Type CMP.
1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Plastic insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.

2.08 RS-485 CABLE
A. Standard Cable: NFPA 70, Type CM.
   1. Paired, 2 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, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
   2. Fluorinated ethylene propylene insulation.
   3. Unshielded.
   4. Fluorinated ethylene propylene jacket.

2.09 LOW-VOLTAGE CONTROL CABLE
A. Paired Cable: NFPA 70, Type CMG.
   1. 1 pair, twisted, 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. 1 pair, twisted, tinned copper conductors.
   2. PVC insulation.
   3. Unshielded.
   4. PVC jacket.
   5. Flame Resistance: Comply with NFPA 262.

2.10 CONTROL-CIRCUIT CONDUCTORS
A. Class 1 Control Circuits: Stranded copper.
B. Class 2 Control Circuits: Stranded copper.
C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF, complying with UL 83.

2.11 FIRE ALARM AND EMERGENCY COMMUNICATIONS SYSTEMS WIRE AND CABLE
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:
   2. Draka Cableteq USA.
   3. Genesis Cable Products; Honeywell International, Inc.
   4. Rockbestos-Suprenant Cable Corp.
   5. West Penn Wire; a brand of Belden Inc.

B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

C. Signaling Line Circuits: Twisted, shielded pairNo. 18 AWG AWG.
   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 2-hour rating.
   1. Low-Voltage Circuits: No. 16 AWG, minimum.
   2. Line-Voltage Circuits: No. 12 AWG, minimum.
   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, NTRL listed for fire alarm and cable tray installation, plenum rated, and complying with requirements in UL 2196 for a 2-hour rating.

2.12 IDENTIFICATION PRODUCTS
   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. Brady Corporation.
      2. HellermannTyton.
      3. Kroy LLC.
      4. PANDUIT CORP.
   B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.
   C. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

2.13 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/EIA-568-B.1.
   C. Factory test UTP cables according to TIA/EIA-568-B.2.
   D. Factory test multimode optical fiber cables according to TIA-526-14-A and TIA/EIA-568-B.3.
   E. Factory sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.
   F. Cable will be considered defective if it does not pass tests and inspections.
   G. Prepare test and inspection reports.

PART 3 EXECUTION

3.01 INSTALLATION OF PATHWAYS
   A. Comply with TIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.
   B. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.
   C. Install manufactured conduit sweeps and long-radius elbows whenever possible.
   D. Pathway Installation in Equipment Rooms:
      1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
      2. Install cable trays to route cables if conduits cannot be located in these positions.
      3. Secure conduits to backboard when entering 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 vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.
3.02 INSTALLATION OF HANGERS AND SUPPORTS
A. Comply with requirements in Division 26 Section "Hangers and Supports for Electrical Systems." for installation of supports for pathways, conductors and cables.

3.03 WIRING METHOD
A. Install wiring in metal raceways and wireways. Conceal raceway except in unfinished spaces and as indicated. Minimum conduit size shall be 3/4 inch. Control and data transmission wiring shall not share conduit with other building wiring systems.
B. Install wiring in raceways except in accessible indoor ceiling spaces and in interior hollow gypsum board partitions where cable may be used. Conceal raceways and wiring except in unfinished spaces and as indicated. Minimum conduit size shall be 3/4 inch. Control and data transmission wiring shall not share conduit with other building wiring systems.
C. Install cable, concealed in accessible ceilings, walls, and floors when possible.
D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

3.04 INSTALLATION OF CONDUCTORS AND CABLES
A. Comply with NECA 1.
B. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.
C. General Requirements for Cabling:
   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.
   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. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
   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.
D. 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.
   2. Install 110-style IDC termination hardware unless otherwise indicated.
   3. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.
E. Outdoor Coaxial Cable Installation:
   1. Install outdoor connections in enclosures complying with NEMA 250, Type 4X. Install corrosion-resistant connectors with properly designed O-rings to keep out moisture.
2. Attach antenna lead-in cable to support structure at intervals not exceeding 36 inches.

F. 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 60 inches apart.
   3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

G. Separation from EMI Sources:
   1. Comply with BICSI TDMM and TIA-569-B recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
   2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
      b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
   3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
      b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
   4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
      b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
   5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.

3.05 FIRE ALARM WIRING INSTALLATION

A. Comply with NECA 1 and NFPA 72.

B. Wiring Method: Install wiring in metal raceway according to Division 26 Section "Raceway and Boxes for Electrical Systems."
   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 raceway system. This system shall not be used for any other wire or cable.

C. Wiring Method:
   1. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.

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.

3.06 POWER AND CONTROL-CIRCUIT CONDUCTORS
A. 120-V Power Wiring: Install according to Division 26 Section "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.

3.07 CONNECTIONS
A. Comply with requirements in Division 28 Section "Perimeter Security Systems" for connecting, terminating, and identifying wires and cables.

B. Comply with requirements in Division 28 Section "Intrusion Detection" for connecting, terminating, and identifying wires and cables.

C. Comply with requirements in Division 28 Section "Access Control" for connecting, terminating, and identifying wires and cables.

D. Comply with requirements in Division 28 Section "Video Surveillance" for connecting, terminating, and identifying wires and cables.

E. Comply with requirements in Division 28 Section "PLC Electronic Detention Monitoring and Control Systems" for connecting, terminating, and identifying wires and cables.

F. Comply with requirements in Division 28 Section "Digital Addressable Fire-Alarm System" for connecting, terminating, and identifying wires and cables.

G. Comply with requirements in Division 28 Section "Refrigerant Detection and Alarm" for connecting, terminating, and identifying wires and cables.

3.08 FIRESTOPPING
A. Comply with requirements in Division 07 Section "Penetration Firestopping."

B. Comply with TIA-569-B, "Firestopping" Annex A.

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.09 GROUNDING

B. For low-voltage wiring and cabling, comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."

3.10 IDENTIFICATION
A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
3.11 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. 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/EIA-568-B.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 meet or exceed applicable requirements in TIA/EIA-568-B.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.
   4. Coaxial Cable Tests: Comply with requirements in Division 27 Section "Master Antenna Television System."

D. 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.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION
SECTION 31 2113
RADON MITIGATION

PART 1 GENERAL

1.01 SUMMARY
A. Provide all work necessary to reduce and maintain radon concentration levels below 4.0 picoCuries per liter (pCi/L) within project buildings. Perform radon pre-mitigation diagnostic testing and analysis, provide radon mitigation system design and installation, perform post-mitigation testing and monitoring, and provide final summary report with building floor plans and radon readings.

1.02 1.2 REFERENCES
A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
1. AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)
2. AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)
   a. ACI 301 (2016) Specifications for Structural Concrete
3. ASTM INTERNATIONAL (ASTM)
   c. ASTM C1002 (2018) Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
   h. ASTM C645 (2014; E 2015) Nonstructural Steel Framing Members
4. GYPSUM ASSOCIATION (GA)
5. INTERNATIONAL CODE COUNCIL (ICC)
6. MASTER PAINTERS INSTITUTE (MPI)
   a. MPI 114 (2012) Latex, Interior, Gloss (MPI Gloss Level 6)
   d. MPI 50 (2012) Primer Sealer, Latex, Interior
7. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
   a. NEMA MG 1 (2016; SUPP 2016) Motors and Generators
8. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
a. NFPA 70 (2017 National Electrical Code; ERTA 1-2 2017; TIA 17-1; TIA 17-2; TIA 17-3; TIA 17-4; TIA 17-5; TIA 17-6; TIA 17-7; TIA 17-8; TIA 17-9; TIA 17-10; TIA 17-11; TIA 17-12; TIA 17-13; TIA 17-14)

9. NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)

10. SHEET METAL AND AIR CONDITIONING CONTRACTORS’ NATIONAL ASSOCIATION (SMACNA)

11. SOUTHERN PINE INSPECTION BUREAU (SPIB)


13. U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
    d. EPA 402-R-93-078 (1993; R 1994) Radon Mitigation Standards
    e. EPA 625-R-92-016 (1993; Am 1994) Radon Prevention in Design and Construction of Schools and Other Large Buildings

14. WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

15. WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)

1.03 1.3 DEFINITIONS

1.04 1.3.1 DESIGN
   A. Documents shall include design drawings, design narrative (basis of design scope and calculations) and product data. Documentation shall show in graphic and quantitative form the extent, design, arrangement, location, relationships, and dimensions of the construction to be provided.

1.05 1.3.2 CONTRACTOR
   A. Contractor shall be United States Environmental Protection Agency (USEPA) Radon Contractor Proficiency (RCP) listed mitigation contractor to meet the contract requirements.

1.06 1.3.3 DESIGNER
   A. Documents shall be prepared and assembled by or under the direct supervision of a state licensed and USEPA RCP listed mitigation designer associated with the Contractor who is responsible for the design and has the qualifications and experience specified.

1.07 1.3.4 CONTRACT DOCUMENTS
   A. Documents furnished contain areas and project requirements for diagnostic testing, design, construction and monitoring of multiple radon mitigation systems.

1.08 1.3.5 LONG TERM RADON DETECTORS
   A. Alpha track, electret ion chamber, or approved equivalent. Devices shall be capable of sensing and recording the presence of radon during a time period of 91 days to 12 months which when analyzed provide a numeric value, measured in pCi/L, for radon concentrations during the time exposed.

1.09 1.3.6 SHORT TERM RADON DETECTORS
   A. Charcoal, electret ion chamber, or approved equivalent. Devices capable of sensing and recording the presences of radon during a time period of 48 hours to 90 days which when
analyzed provide a numeric value, measured in pCi/L, for radon concentrations during the time exposed.

1.10 1.3.7 SUCTION HOLE
A. Location at which vacuum is created for sub-slab communication testing.

1.11 1.3.8 SUCTION POINT
A. Vertical standpipe penetrating into the soil gas environment containing radon and serving as the conduit to exhaust radon gas to the atmosphere.

1.12 1.3.9 TEST HOLE
A. Location at which pressure readings are taken during sub-slab communication testing. Readings are used to evaluate potential effectiveness of a sub-slab depressurization system.

1.13 1.4 SYSTEM DESCRIPTION AND REQUIREMENTS

1.14 1.4.1 PERFORMANCE REQUIREMENTS
A. Radon mitigation systems shall reduce and maintain radon concentration levels below [148 Bq/cu. m.] [4.0 pCi/L] in various buildings shown. Test, design and construct radon mitigation systems in accordance with EPA 402-R-93-078, EPA 402-R-93-003, EPA 402-R-92-004 and as specified. Additional guidance for testing, designing and constructing radon mitigation systems is contained in EPA 625-R-92-016 and EPA 625-R-93-011.

1.15 1.4.2 CRITERIA FOR PRICING DIAGNOSTIC TESTING AND SUCTION POINTS
A. For purposes of uniformly pricing diagnostic testing and the number of suction points to be constructed, base prices on the minimum requirements specified in Attachment B, located at the end of this section. Test locations, suction point locations, pipe sizes, number of fans and discharge points to the building exterior, routing of the radon mitigation systems piping, provision of associated enclosures, and all other work necessary to achieve the desired results specified are the Contractor's responsibility and shall be based on the requirements and restrictions, if any, specified herein.
   1. NOTE: The number of suction points for each building specified in Attachment B are the recommended number based on existing information and are provided for pricing purposes only. The actual number of suction points required may be more or less depending on the results of the site investigations, effectiveness of sub-slab communication, diagnostic testing, and post mitigation testing and monitoring. If the final number of suction points differs from those specified, the Government will issue a modification pursuant to Contract Clause FAR 52.243-4 Changes.

1.16 1.5 SUBMITTALS
A. Product Data
   1. Radon mitigation systems enclosures
   2. Radon mitigation systems components
   3. Radon mitigation systems enclosure components
   4. Radon diagnostic testing devices

B. Design Data
   1. Radon mitigation systems design narrative

C. Test Reports
   1. Pre-mitigation testing
   2. Post mitigation testing

D. Certificates
   1. Contractor qualifications
   2. Contractor experience
   3. Worker protection plan

E. Manufacturer's Instructions
   1. Radon mitigation systems components
   2. Radon mitigation systems enclosure components
F. Operation and Maintenance Data
   1. Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

G. Closeout Submittals
   1. Radon Detector Location Log
   2. Testing laboratory certification
   3. Proof of current calibration for testing devices

1.17 1.6 DESIGN REQUIREMENTS

A. Prepare designs in accordance with the requirements of EPA 402-R-93-078 except that when
the contract specification requirements are more stringent, the contract specification shall take
precedence. The Contractor shall:
   1. Prepare design drawings and assemble and provide product data for construction of
      multiple radon mitigation systems;
   2. Prepare design narrative supporting the design shown;
   3. Coordinate all elements of the design to ensure there are no conflicts;
   4. For each building, present information 100 percent complete in a single submission and in
      sufficient detail to permit a complete review by the Government. The Government's review
      is to check the design for conformance with the requirements contained in the contract
documents. Design approval shall not be construed as a waiver from performing
requirements contained in the contract which may have been omitted from the Contractor
prepared design documents.
   5. Provide [six] copies of the complete design documents.

1.18 1.6.1 DESIGN DRAWING REQUIREMENTS

A. Prepare, organize, and present drawings in the format considered standard industry practice for
radon mitigation work and as described herein. Provide drawings complete, accurate and
explicit enough to show compliance with the contract requirements and to permit construction.
Drawings illustrating systems proposed to meet the requirements of the contract specification
shall reflect proper detailing for each system to assure appropriate use, proper fit, compatibility
of components and coordination with the design narrative and the contract specification.
Coordinate drawings to ensure there are no conflicts between design disciplines and between
drawings and the contract specification. Title block shall be the same as that used in the project
drawings provided in the project specification. Each Contractor prepared drawing shall bear the
certification number and signature of the RCP listed individual responsible for the work
portrayed on that drawing and proposed to meet the contract requirements.

1.19 1.6.1.1 RADON MITIGATION SYSTEMS (FORMAT AND CONTENT)

A. On copies of the building floor plans, locate and identify each diagnostic test performed using
alpha numeric designations. Prepare a separate drawing for each type of diagnostic test
performed in each building. Provide grab sample (GS) data on Attachment C. Provide sub-slab
communication (SSC) test data on Attachment D. Provide short term detector (STD) data on
copies of the "Device Placement Log" contained in EPA 402-R-92-014. On copies of the
building floor plans, show suction point(s) and routing of the radon mitigation system(s) piping to
the building exterior. Indicate pipe size, length of piping in the network, number and nature of
flow obstructions, such as fittings, and fan characteristics for each system. Supplement the floor
plan information with additional drawings keyed to each floor plan location showing riser
diagrams, utility connections and routing, component installations, elevations, sections and
details of the radon mitigation system(s). Also, provide construction and installation details such
as supporting systems, attachment methods and surface penetration and sealing methods.
Drawings shall not be smaller than A4 (297 by 210 mm) 8 1/2 by 11 inches. Government will
furnish [five] copies of the project specification.

1.20 1.6.1.2 RADON MITIGATION SYSTEMS ENCLOSURES (FORMAT AND CONTENT)

A. Prepare drawings not smaller than A4 (297 by 210 mm) 8 1/2 by 11 inches portraying the
proposed method for enclosing each radon mitigation system in occupied spaces. All spaces
shall be considered to be occupied spaces except for mechanical and electrical rooms,
warehouses, storerooms, janitor closets, crawl spaces, and attic spaces. Enclosures are not required for portions of systems installed above suspended acoustical ceilings. Drawings shall indicate methods and materials to be used in constructing the enclosures and accesses for all operating components. Drawings showing typical enclosures and installations are acceptable (i.e. corner installation, mid-wall installation, etc.).

1.21 1.6.2 DESIGN NARRATIVE

1.22 1.6.2.1 FORMAT

A. The design narrative shall include a cover page indicating the project title, location, construction contract number and preparer, a table of contents and tabbed or colored page separations for quick reference. Submit design narrative prepared on A4 (297 by 210 mm) 8 1/2 by 11-inch white paper. The design narrative shall be bound in one volume.

1.23 1.6.2.2 CONTENT

A. The design narrative shall include a basis of design and calculations. Specific requirements relative to the technical content to be provided are specified in this specification section. The design narrative shall be a presentation of facts to demonstrate that the project requirements are fully understood and that the design is based on sound engineering. The design narrative shall include and address the following:

1. Executive summary.
2. Scope of work.
4. Diagnostic testing performed and results of the testing (include Attachments C and D and the Device Placement Logs for the short term detectors).
5. Diagnostic test devices and equipment used.
6. Locations where readings were recorded (include floor plans).
7. Suspected or confirmed entry points of radon into the buildings (narrative or show on floor plans).
8. Potential problems which may be caused by active (fan-powered) radon mitigation systems, if any.
10. Radon mitigation method chosen to reduce radon concentrations levels below [148 Bq/cu. m.] [4.0 pCi/L] and reasons for choosing the method.
11. Data and calculations to verify negative pressure exists throughout the soil gas environment containing radon sufficient to exhaust the soil gas to the atmosphere under all weather and building operating conditions.
12. Statement of compliance with applicable laws, ordinances, criteria, rules, and regulations of Federal, State, regional and local authorities regarding radon mitigation.
13. Appendices (to include design drawings, forms and logs, laboratory analysis sheets, etc.).

1.24 1.6.3 DESIGN REVIEW AND APPROVAL

A. The design will be reviewed and approved by the Government prior to start of construction. The Government's review is to check the design for conformance with the contract requirements. Design approval does not relieve the Contractor of the responsibility of meeting the requirements of the contract and providing radon mitigation systems which, while active, reduce and maintain radon concentration levels below [148 Bq/cu. m.] [4.0 pCi/L]. The design of the radon mitigation systems and enclosures shall be approved prior to submission of construction submittals for the materials to be used in the construction of the systems and enclosures. Contract completion time includes 30 days for review and approval of the design. Partial or incomplete design submissions will not be reviewed and will be immediately returned to the Contractor for completion and resubmission. Design submissions found to be not in compliance with the contract requirements will be returned to the Contractor for correction and resubmission. The Contractor shall make such modifications as may be necessary to bring the design into compliance at no change in contract price and schedule. Under either of these circumstances, the Government will have a 30-day review period adjusted to commence upon
receipt of the revised design documents with no increase in the total contract completion time provided.

1.25 1.7 RADON DETECTOR LOCATION LOG
A. Prepare and provide to the Contracting Officer a Radon Detector Location Log for each building detailing the identity and location of each short term and long term radon detector. Prepare the log using copies of the "Device Placement Log" contained in EPA 402-R-92-014, and provide the appropriate information as line items. In addition to the log, on a copy of the building floor plans, locate and identify each short term and long term detector.

1.26 1.8 WORKER HEALTH AND SAFETY
A. Provide in accordance with EPA 402-R-93-078. Prepare a worker protection plan in accordance with EPA 402-R-93-078.

1.27 1.9 QUALITY ASSURANCE
1.28 1.9.1 CONTRACTOR QUALIFICATIONS AND EXPERIENCE
A. Within 15 days after award, submit written evidence or data demonstrating that the Contractor and/or one or more subcontractors employed by the Contractor possess the qualifications and experience specified below.

1.29 1.9.1.1 CONTRACTOR QUALIFICATIONS
A. The person responsible for diagnostic testing, design, construction and on-site supervision, as required by the specifications, shall have successfully completed the requirements of and shall be maintaining a current listing in the USEPA RCP Program. Alternatively, in a State with legislation requiring mandatory credentialing for this work, compliance with the State legislation is acceptable. Evidence showing successful completion of the requirements of the USEPA National RCP Program shall include copy of current, valid USEPA RCP photo identification card or equivalent documentation issued by the State.

1.30 1.9.1.2 CONTRACTOR EXPERIENCE
A. Submit written evidence demonstrating that the Contractor has successfully designed and installed at least [two] [_____] radon mitigation systems of the same or similar to the type required herein. Experience proof shall include but not be limited to:
1. The contract name and number, completion dates of the project and the total cost of the project;
2. The names, telephone numbers and fax number of the facility or installation for whom the radon mitigation system design, construction and/or testing were performed;
3. The name, telephone number and fax number of a supervisory level point of contact at each facility or installation who has knowledge of the Contractor's performance.

1.31 1.9.2 TESTING LABORATORY
A. Submit testing laboratory certification as proof that the testing laboratory performing radon detector analysis has successfully completed the requirements of the USEPA Radon Measurement Proficiency (RMP) Program and is qualified and authorized to perform such analysis. Alternatively, in a State with legislation requiring mandatory credentialing for this work, compliance with the State legislation is acceptable.

1.32 1.9.3 DIAGNOSTIC TESTING EQUIPMENT
A. Submit proof of current calibration for testing devices used in performing diagnostic testing.

1.33 1.9.4 ON-SITE SUPERVISION
A. No work at the site will be permitted without the presence of a person possessing the qualifications specified elsewhere in this section, namely USEPA RCP listing or the State equivalent, where applicable.
1.34 1.10 DELIVERY, STORAGE AND HANDLING

1.35 1.10.1 DELIVERY OF PRODUCTS
A. Deliver materials to the site in an undamaged condition. Deliver proprietary items in manufacture’s original unopened and undamaged containers of packages with manufacture’s name and brand and other pertinent data such as specification number, type, and class, date of manufacture. Schedule deliveries of materials to coincide with scheduled installation.

1.36 1.10.2 STORAGE AND HANDLING
A. Carefully store materials off the ground to provide proper ventilation, drainage and protection against weather and dampness. Protect materials from marring, staining, rust, damage and overload and from contaminants such as grease, oil and dirt. Store materials at temperatures recommended by the manufacturer. Handle material to avoid damage such as chipping and breaking. Replace damaged material.

1.37 1.11 PROJECT CONDITIONS

1.38 1.11.1 PROJECT DRAWINGS
A. Building floor plans are provided at the end of this section.

1.39 1.11.2 EXISTING CONDITIONS
A. The buildings were tested for radon. The test dates, radon levels recorded and detector type used are indicated on Attachment A, located at the end of this section. The approximate locations of the readings are shown on the project drawings. [Drawings also show suspected [and confirmed] radon entry points into the buildings.]

1.40 1.11.3 BUILDING DESCRIPTIONS

1.41 1.12 POST MITIGATION TESTING - SCHEDULE OF PRICES DATA
A. In addition to the requirements specified in Section entitled "Price and Payment Procedures", the following applies: In accordance with Contract Clause FAR 52.232-5 Payments Under Fixed-Price Construction Contracts, include in the "Schedule of Prices" a line item for the work required under paragraph entitled "Long Term." This line item shall be a minimum of 10 percent of the contract price. Payment of these funds will be made only after the Contracting Officer has received the radon testing results from the testing laboratory and the readings for the long term testing are below [148 Bq/cu. m.] [4.0 pCi/L].

PART 2 PRODUCTS

2.01 2.1 RADON MITIGATION SYSTEMS

2.02 2.1.1 SYSTEM PERFORMANCE
A. Radon mitigation systems shall reduce and maintain radon concentration levels below [148 Bq/ cu. m.] [4.0 pCi/L] after activation of the mitigation systems.

2.03 2.1.1.1 SYSTEM PIPING
A. Route radon mitigation systems piping so as not to interfere with the daily operations and functions of the building occupants. Keep visibility of the systems to a minimum. Enclose each radon mitigation system in occupied spaces, however, all operating components shall be accessible for maintenance and repair. All spaces shall be considered to be occupied spaces except for mechanical and electrical rooms, warehouses, storerooms, janitor closets, crawl spaces, [_____] and attic spaces. Enclosures are not required for portions of systems installed above suspended acoustical ceilings.

2.04 2.1.1.2 SYSTEM OUTLET LOCATION
A. Mitigation system discharge points shall be as specified in EPA 402-R-93-078. Prevent foreign objects from entering the outlet. [Rain caps are not permitted.] Maintain water tight seal through all penetrations to the building exterior.
2.05 2.1.1.3 SYSTEM FAILURE WARNING MONITOR
A. Provide a means to detect and announce each radon mitigation system failure. System failure is defined as:
2. Mechanical failure: fan or other mechanical failure.
3. System leakage: pipe breakage or crack. Provide an audio or visual annunciator device to indicate system failure and locate the annunciator device in an occupied space. Conform to the requirements of EPA 402-R-93-078.

2.06 2.1.1.4 AIR CLEANERS
A. Air cleaners shall NOT be used as a radon reduction method.

2.07 2.1.1.5 VENTILATION DEVICES
A. Devices which reduce radon solely by increasing ventilation to the occupied space shall NOT be used.

2.08 2.1.1.6 BACK DRAFTING
A. Radon mitigation system shall NOT cause back drafting of building chimneys.

2.09 2.1.2 RADON MITIGATION SYSTEMS COMPONENTS
A. Mechanical and electrical materials, fabrication, construction and installation shall conform to the following industry standards:
2. In-line Tubular Centrifugal Fans: AMCA 210 and UL listed.
3. Electrical Work: NFPA 70, NEMA MG 1 and EPA 402-R-93-078, No. 12 AWG minimum wire size, solid copper installed in EMT or surface metal raceway.
5. Sealants: ASTM C920, polyurethane, Type S, Grade P for horizontal application, Grade NS for vertical application, Class 25, Use T.
6. Crawl space soil-gas retarder membrane shall be minimum [40] [60] mils thick.
7. Mock Downspouts and Fittings: Aluminum, ASTM B209M ASTM B209, minimum 0.81 mm 0.032 inch thick, color to match existing. Seal seams and joints. Use downspout only on the building exterior above the fan with appropriate round to downspout shape PVC adapter.]

2.10 2.2 RADON MITIGATION SYSTEMS ENCLOSURES
A. [Radon mitigation systems enclosure components, materials, fabrication, construction and installation shall conform to the following industry standards:]
1. Concrete: ACI 301.
2. Wood Studs and Furring: WWPA G-5, WCLIB 17, SPIB 1003 or NELMA Grading Rules Standard Light Framing, air dried or kiln dried lumber.
5. Sealants: ASTM C834.
6. Painting/Coating: MPI 50 and [[MPI 139] [MPI 141][MPI 114]], provide primer, intermediate and top coat. Coating material shall match existing. Color shall match the adjacent surfaces.
7. Hardware: Shall be of the type and size necessary for the project requirements. Sizes, types and spacing of fasteners for manufactured building materials shall be as recommended by the product manufacturer. Hardware exposed to the weather or embedded in or in contact with preservative treated wood, exterior masonry, or concrete walls or slabs shall be zinc coated. [Radon mitigation systems enclosure components, materials, fabrication, construction and installation for concrete, wood studs and furring, metal studs and furring, gypsum wallboard, sealants and painting shall conform to the
requirements specified in the respective specification sections addressing this work contained in the project specification.]

PART 3 EXECUTION

3.01 3.1 RADON TESTING
A. Perform radon testing in accordance with EPA 402-R-93-003 and EPA 402-R-92-004. The Contractor shall arrange that all laboratory test results are sent from the testing laboratory directly to the Contracting Officer with one copy to the Contractor.

3.02 3.1.1 PRE-MITIGATION TESTING
A. Within [30] [_____] days after award, test buildings to determine the relative radon concentration levels in these buildings. Perform diagnostic testing prior to design of the radon mitigation systems using radon diagnostic testing devices approved by the Contracting Officer. Test basements, areas of buildings where the underside of the floor comes in direct contact with the soil as well as areas that can pull ground floor air or soil gas, such as, elevator shafts, stairwells, pipe chases, crawl spaces with dirt floors, underground walkways and tunnels. Diagnostic testing shall determine the following:
   1. Relative radon concentration levels in the building.
   2. Radon entry points into the building. SECTION 31 21 13 Page 23.
   3. Effectiveness of sub-slab communication.
   4. Number and location of suction points required to reduce and maintain radon concentration levels below [148 Bq/cu. m.] [4.0 pCi/L].

3.03 NOTE: THE NUMBER OF SUCTION POINTS FOR EACH BUILDING SPECIFIED IN ATTACHMENT B ARE THE RECOMMENDED NUMBER BASED ON EXISTING INFORMATION AND ARE PROVIDED FOR PRICING PURPOSES ONLY. THE ACTUAL NUMBER OF SUCTION POINTS REQUIRED MAY BE MORE OR LESS DEPENDING ON THE RESULTS OF THE SITE INVESTIGATIONS, EFFECTIVENESS OF SUB-SLAB COMMUNICATION, DIAGNOSTIC TESTING, AND POST MITIGATION TESTING AND MONITORING. IF THE FINAL NUMBER OF SUCTION POINTS DIFFERS FROM THOSE SPECIFIED, THE GOVERNMENT WILL ISSUE A MODIFICATION PURSUANT TO CONTRACT CLAUSE FAR 52.243-4 CHANGES. SITE INVESTIGATION DATA AND RESULTS OBTAINED FROM DIAGNOSTIC TESTING SHALL BE USED TO DESIGN THE RADON MITIGATION SYSTEMS AND SHALL BE PROVIDED FOR REVIEW AND APPROVAL BY THE GOVERNMENT. AS A MINIMUM, PERFORM THE NUMBER OF DIAGNOSTIC TESTS SUGGESTED IN ATTACHMENT B. EACH SUB-SLAB COMMUNICATION TEST SHALL INCLUDE A SUCTION HOLE AND AT LEAST FOUR TEST HOLES. USE NON-SHRINK GROUT TO REPAIR ALL HOLES RESULTING FROM DIAGNOSTIC TESTING AND RESTORE FLOOR AND WALL FINISHES TO MATCH EXISTING ADJACENT SURFACES.

3.04 3.2 DESIGN RADON MITIGATION SYSTEMS AND SYSTEMS ENCLOSURES
A. Design radon mitigation systems as required to achieve radon detection test results below [148 Bq/cu. m.] [4.0 pCi/L] based on radon diagnostic test results, EPA 402-R-93-078 and the information provided herein. Design the systems enclosures to accommodate the radon mitigation systems configurations and the adjacent or surrounding walls, partitions, ceilings and roof construction.

3.05 3.3 RADON MITIGATION SYSTEMS INSTALLATION

3.06 3.3.1 INSTALLATION
A. Provide radon mitigation systems as indicated in the approved design drawings, as specified in EPA 402-R-93-078 and as required by the specifications and standards referenced herein for the respective materials using workmen skilled in the trades involved. Install piping plumb and parallel to existing walls, partitions and ceilings as appropriate, slope horizontal runs to drain, and secure in place in a rigid and substantial manner.

B. Seal new and existing floor slab penetrations in accordance with EPA 402-R-93-078 and as specified herein. Prevent entry of soil gas into the building and exhausting of conditioned air via
the radon mitigation system. Seal cracks and openings around floor slab penetrations with polyurethane sealant. Provide backer rod or comparable filler material as required. Insure that all penetrations to the building exterior are weathertight.

C. Lay work out in advance. Exercise care where cutting, channeling, chasing or drilling floors, walls, partitions, ceilings or other surfaces as necessary for proper installation, support or anchorage. Patch and repair damage to buildings, piping and equipment using workmen skilled in the trades involved.

D. As part of the site investigation, the Contractor shall identify furniture, carpeting or other portable materials and equipment which must be relocated to provide for the installation of the radon mitigation systems, if any.

E. The Government will work with the Contractor to coordinate relocations. Coordinate all work with the Contracting Officer.

3.07 3.3.2 SUPERVISION
A. Installation of the radon mitigation systems shall be supervised by the RCP listed individual responsible for the design of the systems.

3.08 3.3.3 ELECTRICAL WORK

3.09 3.3.4 MECHANICAL WORK
A. ICC IMC, ICC UMC, SMACNA 1378 and EPA 402-R-93-078.

3.10 3.3.5 SYSTEM IDENTIFICATION
A. Label all components of the radon mitigation systems including, but not limited to, piping (every 3 meters ten feet), enclosures, fans, electrical conduit (every 3 meters ten feet) and circuit breakers. Labels shall read:
   B. Radon Reduction System. Do Not Turn Off.
   C. Public Works Office Phone [______]
   D. [or as specified by the Contracting Officer.]

3.11 3.4 RADON MITIGATION SYSTEM ENCLOSURES INSTALLATION
A. Provide enclosures as indicated in the approved design drawings and as required by the specifications and standards referenced herein for the respective materials using workmen skilled in the trades involved. Install enclosures plumb, level and parallel to existing walls, partitions and ceilings as appropriate, and secure in place in a rigid and substantial manner.

3.12 3.5 FIELD QUALITY CONTROL

3.13 3.5.1 RADON MITIGATION SYSTEM INSPECTION
A. Each system shall be inspected and approved in writing by the RCP listed individual responsible for the design of the system. Verify the presence of fire stops. Deficiencies shall be corrected by the Contractor at no additional cost to the Government.

3.14 3.5.2 POST MITIGATION TESTING AND MONITORING
A. Perform post mitigation radon testing in the buildings as specified in EPA 402-R-93-078 and herein.

3.15 3.5.2.1 SHORT TERM
A. Test each radon mitigation system for effectiveness no sooner than 24 hours nor later than 15 days after activation of the radon mitigation system. Provide short term radon detectors (charcoal, electret ion chamber or approved equivalent) at the rate of one detector per 186 square meters 2,000 square feet but not less than one detector per enclosed space, except for closets. On copies of the building floor plans, locate and identify each short term detector and
provide short term detector data on copies of the "Device Placement Log" contained in EPA 402-R-92-014. At the end of the testing period, the Contractor shall collect the detectors and send the detectors to the testing laboratory for analysis. Provide radon test results of the effectiveness of the mitigation systems not later than 30 days after collecting the detectors. Radon test results shall be sent from the testing laboratory directly to the Contracting Officer with one copy to the Contractor. Complete the line item information on the "Device Placement Log." Radon test results above [148 Bq/cu. m.] [4.0 pCi/L] shall require system redesign and installation modifications as necessary to achieve radon test results below [148 Bq/cu. m.] [4.0 pCi/L]. Submit design modifications to the Government for review and approval. After approval of the design modifications, provide installation modifications to the radon mitigation system and retest for effectiveness. Repeat this short term test procedure until test results below [148 Bq/cu. m.] [4.0 pCi/L] are achieved. System modifications (as-built systems installations) shall be reflected in the Contractor's design documents (drawings and design narrative).

3.16 3.5.2.2 LONG TERM

SECTION 32 0116.74
IN PLACE HOT REUSED ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Heating, scarifying, remixing, placing, and compacting existing asphaltic concrete.
   B. Milling of existing wearing course

1.02 REFERENCE STANDARDS

1.03 QUALITY ASSURANCE
   A. Perform Work in accordance with Al MS-20.

1.04 FIELD CONDITIONS
   A. Do not perform work when weather conditions will not permit successful completion of the Work.
   B. If ambient air temperature is below 50 degrees F (10 degrees C), obtain approval prior to proceeding with the work.

PART 2 PRODUCTS

2.01 MATERIALS
   B. Virgin Mix Materials: Provide in accordance with State of Ohio Department of Highway Standards.
   C. Seal Coat: Jennite NJ-S2 "pitch" coal tar emulsion complying with ASTM D5727. type.
   D. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with FS TT-P-115, Type II or AASHTO M 248, Type F.
      1. Select from colors below; distinguish locations if more than one color is required.
   E. Wheel Stops: Precast, air-entrained concrete, 2500-psi (17.2-MPa) minimum compressive strength, 4-1/2 inches (115 mm) high by 9 inches (225 mm) wide by 72 inches (1800 mm) long. Provide chamfered corners and drainage slots on underside and holes for anchoring to substrate.
      1. Dowels: Galvanized steel, 3/4-inch (19-mm) diameter, 10-inch (254-mm) minimum length.
   F. Asphalt Geotextile Overlay:
      1. US Fabrics, Inc., US 90P nonwoven needlepunched geotextile made of 100% polypropylene staple filaments.

2.02 EQUIPMENT
   A. Recycling Equipment: Type for the intended purpose as follows:
      1. Self-propelled, with automated mix controls.
   B. Heated Asphalt Remixer: Type for the intended purpose as follows:
      1. Self-propelled, with a wheel base sufficient to maximize leveling action.
      2. Operational heater width of 10 feet (3 m) minimum to 12 feet (3.6 m) maximum; protective insulated hood over heated areas; heated, adjustable, direct flame heating not permitted.
      3. Capable of processing 5,500 sq yd (4,645 sq m) of surface per day.
   C. Milling Unit: Type for the intended purpose as follows:
      1. Self-propelled, with a wheel base sufficient to maximize leveling action.
      2. Capable of loosening pavement material to a 2 inch (50 mm) depth.
   D. Onboard Pug Mill: Type for the intended purpose as follows:
      1. Horizontal shaft, hydrostatically driven, heated mixer.
      2. Capable of adding and remixing recycled material, rejuvenating agent, and virgin mat.
3. To produce uniform mixture at required temperature.

E. Compactor: Pneumatic tired roller for initial compaction; steel wheeled rollers required for additional compaction and smoothness. An oscillating screed or tamper is not acceptable.

2.03 RECYCLED MIX
A. Remove random samples of existing pavement material; record sample location and perform testing.
B. Establish mix design from test sample materials.
C. Identify asphalt content, aggregate gradation curve, penetration value, viscosity of residual asphalt, and density.
D. Establish recycling agent demand ratios; determine maximum stability curve to support demand ratios.
E. Maintain minimum moisture content of 3 percent.

PART 3 EXECUTION

3.01 PREPARATION
A. Mechanically sweep pavement surfaces immediately prior to commencement of work. Clean pavement surfaces of loose foreign matter. Verify that surfaces are dry.
B. Protect existing improvements, overhanging trees, and plant life from heat damage by individual shielding and water spray.
C. Remove and store manhole covers and frames.

3.02 REMOVAL
A. Do not disfigure adjacent Work.
B. Heat pavement surface uniformly by continuous movement of a heated scarifier.
C. Execute removal to a depth not less than 1/2 inch (12 mm) at any point across the full width of surface without detrimental aggregate degradation.

3.03 MIXING
A. Mix removed material by spinning or tumbling action for asphalt rejuvenation.
B. Blend recycled material, recycling agent, and virgin material in pug mill in accordance with Asphalt Recycling and Reclaiming Association' ARRA ARS-5-HR, Proven Guidelines for Hot-Mix Recycling.
C. Maintain temperature of remixed material, directly behind the screed, as follows:
   1. Air Temperature: 50 Degrees F (10 Degrees C); Mix Temperature: 250 Degrees F (120 Degrees C)
   2. Air Temperature: 60 Degrees F (15 Degrees C); Mix Temperature: 240 Degrees F (115 Degrees C)
   3. Air Temperature: 70 Degrees F (21 Degrees C); Mix Temperature: 230 Degrees F (110 Degrees C)

3.04 PLACING
A. Form a gutter cut 3/4 inch (19 mm) deep tapered to a feather edge for a minimum of 3 feet (1000 mm) from lip of gutter; for subsequent surface overlay to be flush with the lip of the gutter.
B. Discharge remixed material and added virgin material by a heated vibratory precompactor.
C. Spread material in a windrow for profiling and precompaction.
D. Compact by a heated vibratory screed to a uniform cross sectional thickness.
E. Place mixed material to thicknesses indicated. Thickness not less than 3/4" inch. (Thickness not less than 19.05 mm.)

3.05 ROLLING AND COMPACTING
A. Roll and compact pavement materials to elevations existing before commencing the Work.
B. Complete the compaction process within 5 minutes of removal.
C. Compact pavement by rolling. Do not displace or extrude pavement from position.
D. Develop rolling with consecutive passes to achieve even and smooth finish, without roller marks.
E. Reinstall manhole covers and frames.

3.06 SEAL COAT
   A. Apply seal coat to top surface of wearing course in accordance with Asphalt Institute MS-19.

3.07 PROTECTION
   A. Do not permit traffic over surface for 2 hours.

   END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Maintain plants in manner that promotes health, growth, color and appearance, to quality levels specified; replace dead, dying, and damaged plants at no extra cost to Owner.
      1. It is Contractor's responsibility to determine type and quantity of soil amendments and fertilizer required.
   B. Clean up landscaped areas.
   C. Maintenance Period: The time frame covered by these requirements is 90 days:

1.02 RELATED REQUIREMENTS
   A. Section 01 5713 - Temporary Erosion and Sediment Control.
   B. Section 32 9219 - Seeding.
   C. Section 32 9300 - Plants.

1.03 REFERENCE STANDARDS

1.04 QUALITY ASSURANCE
   A. Installer Qualifications:
      1. Maintenance Contractor: The contractual entity that performed the planting installation.

1.05 DELIVERY, STORAGE, AND HANDLING
   A. Deliver U.S. EPA-controlled materials to site in original containers with legible labels indicating registration number and registered uses.
   B. Deliver fertilizer and manufactured soil amendments to site in original containers bearing manufacturer's chemical analysis, name, trade name or trademark, and indication of compliance with applicable state and federal laws and regulations; alternatively, bulk delivery with equivalent certificate is acceptable.
   C. Store fertilizer, soil amendments, and mulch in dry locations away from contaminants.
   D. Do not store pesticides, herbicides, or other chemical treatment materials in locations where they could damage seeds or plants.

PART 2 PRODUCTS
PART 3 EXECUTION

3.01 EXAMINATION
   A. If soil analysis has not already been performed, take sufficient samples to obtain a comprehensive analysis; perform analysis in accordance with ASTM D4972.

3.02 LANDSCAPE MAINTENANCE - GENERAL
   A. Protect existing vegetation, pavements, and facilities from damage due to maintenance activities; restore damaged items to original condition or replace, at no extra cost to Owner.
   B. General Cleanup: Remove debris from all landscape areas at least once a week and from turf areas before each mowing.
      1. Debris consists of trash, rubbish, dropped leaves, downed branches and limbs of all sizes, dead vegetation, rocks, and other material not belonging in landscaped areas.
      2. Remove debris from site and dispose of properly.
C. Watering, Soil Erosion, and Sedimentation Control: Comply with federal, state, local, and other regulations in force; prevent over-watering, run-off, erosion, puddling, and ponding.
   1. Repair temporary erosion control mechanisms provided by others.
   2. Repair eroded areas and replant, when caused by inadequate maintenance.
   3. Prevent sediment from entering storm drains.
D. Trees: Exercise care to avoid girdling trees; provide protective collars if necessary; remove protective collars at end of maintenance period.
E. Fertilizing: Apply fertilizer only when necessary.
F. Drainage Channels: Remove obstructions in gutters, catch basins, storm drain inlets, yard drains, swales, ditches, and overflows.
   1. Remove grates from catch basins to clean.
   2. Prevent encroachment of other vegetation on turfed surface drainage channels.
G. Health Maintenance: Inspect all plants regularly for health:
   1. Eradicate diseases and damaging pests, regardless of severity or speed of effect.
   2. Treat accidental injuries and abrasions.
   3. If a plant is unhealthy but not yet dead, according to specified definitions, determine reason(s) and take remedial action immediately.
   4. Remove dead plants immediately upon determining that they are dead.
H. Pesticide and Herbicide Application: Comply with manufacturer's instructions and recommendations and applicable regulations.
   1. Obtain Owner's approval prior to each application.
   2. Apply in manner to prevent injury to personnel and damage to property due to either direct spray or drifting, both on and off Owner's property.
   3. Use backflow preventers on hose bibbs used for mixing water; prevent spills.
   4. Inspect equipment daily before application; repair leaks, clogs, wear, and damage.
   5. Do not dispose of excess mixed material, unmixed material, containers, residue, rinse water, or contaminated articles on site; dispose of off site in legal manner.
   6. Rinse water may be used as mix water for next batch of same formulation.
   7. Contractor is responsible for all recordkeeping, submissions, and reports required by laws and regulations.
I. Replanting: Perform replacement and replanting immediately upon removal of dead plant.

3.03 RENOVATION OF ESTABLISHED TURF
A. Remove turf from around trees to radius of 18 inches (450 mm) from base of tree trunk. Cut turf out and remove; do not simply mow. Trim turf edge as specified.
B. Trim perimeter of turf area and around intervening objects as specified under Turf Maintenance.
C. Eliminate undesirable grasses and weeds. Remove as much thatch as possible.
D. Water as soon as possible after planting. Do not allow newly planted material to become dry.
E. Begin normal mowing once grass reaches 1-1/2 times specified mowing height.

3.04 TURF MAINTENANCE
A. Maintain turf in manner required to produce turf that is healthy, uniform in color and leaf texture, and free from weeds and other undesirable growth.
   1. Grass Density - Lawns: 20 plants per square foot (200 plants per square meter), minimum.
   2. Bare Spots - Lawns: 2 percent of total area, maximum; 6 inches (150 mm) square, maximum.
   3. Keep turf relatively free of thatch, woody plant roots, diseases, nematodes, soil-borne insects, stones larger than 1 inch (25 mm) in diameter, and other materials detrimental to grass growth.
   4. Limit broadleaf weeds and patches of foreign grass to a maximum of 2 percent of the total area.
B. Mowing: During growing season(s) mow turf to uniform height, in manner that prevents scalping, rutting, bruising, and uneven or rough cutting.
   1. Prior to mowing clean all debris and leaves from turf surface.
   2. Schedule frequency of mowing so that no more than one-quarter to one-third of grass leaf length is removed during a cutting.
   3. Make each successive mowing at approximately 45 degrees to the previous mowing, if practical.
   4. Cool Season Grasses:
      a. Reduce mowing height in fall and spring.
      b. Use rotary type mowers; mulcher type mowers may be used.
   5. Warm Season Grasses:
      a. Increase mowing height slightly as fall approaches.
      b. Use reel type mowers; do not use mulcher mowers.

3.05 PLANTING BED MAINTENANCE
A. Planting beds include all planted areas except turf.
B. Begin maintenance immediately after plants have been installed; inspect at least once a week and perform needed maintenance promptly.
C. Keep planting beds free of pests; remove weeds and grass by hand before reaching 1 inch (25 mm) height.
D. Do not allow climbing, twining, or creeping plants to encroach into other species.
E. Replace mulch as required and remove debris.

3.06 TREE AND SHRUB MAINTENANCE
A. Trees will be considered dead when main leader has died back or when 25 percent or more of crown has died; except as otherwise indicated for palm trees.
B. Shrubs will be considered dead when 25 percent or more of plant has died.
C. Inspect woody plants for health by scraping up to 1/16 inch (2 mm) square area of bark; no green cambium layer below bark shall be evidence of death.
D. Adjust stakes, guys and turnbuckles, ties, and trunk wrap as required to promote growth and avoid girdling.
E. Pruning: Unless otherwise indicated, prune only to maintain balanced natural shape; follow recommendations of ANSI A300 and ANSI Z133.1 and best local practices for species involved.
F. Shrubs: Prune at least once during maintenance period at best time to influence ultimate shape and size for the particular species.
   1. Prune to balance the plant's form and according to its natural growth characteristics.
   2. Remove water shoots, suckers, and branches not conforming to desired shape and size.
G. Hedges: Trim to encourage growth into voids and gaps.
H. Young Trees: Prune at least once during maintenance period at best time to influence ultimate shape and size for the particular species; do not remove or cut off leader.
I. Renovation of Established Shrubs: Prune and trim as required to improve shape and balance as appropriate to the particular species; remove dead, damaged, and diseased branches and limbs; do not remove excess growth except as follows:
   1. Remove growth in front of windows, above or obstructing entranceways and walkways, leaning against structures, and obstructing vision at street intersections.
J. Renovation of Established Trees (Except Palm Trees):
   1. Remove dead, damaged, and diseased branches and limbs and structurally weak limbs that may be a safety hazard.
   2. Remove growth in front of windows, above or obstructing entranceways and walkways, and leaning against structures.
   3. Remove growth obstructing traffic signs or vision at street intersections.
4. Remove branches that extend over buildings or otherwise endanger roofs.
5. Remove low-hanging branches over vehicular traffic routes to height necessary to clear expected traffic including buses and moving vans.

3.07 CLEANING
A. Remove fallen deciduous leaves in Fall; removal may wait until all leaves have fallen.
B. Clean adjacent pavements of plant debris and other debris generated by maintenance activities.
C. Remove and dispose of general cleanup debris and biodegradable debris in a proper manner; Owner's trash collection facilities may be used.
D. Remove and dispose of general cleanup debris and biodegradable debris in a proper manner.
   1. Biodegradable Debris: Owner will designate a compost pile on site where biodegradable debris may be deposited; branches and bark are not considered biodegradable.
   2. Branches and Bark: Owner will designate a wood chip storage area; machine-chip all branch and bark debris.
   3. Non-Biodegradable Debris: Owner's trash collection facilities may be used.

3.08 CLOSEOUT ACTIVITIES
A. 10 days prior to end of maintenance period, submit request for final inspection.

END OF SECTION
PART 1  GENERAL

1.01  SECTION INCLUDES
A. Steel guardrail and steel posts.
B. Excavating for post bases.

1.02  RELATED REQUIREMENTS
A. Section 03 3000 - Cast-in-Place Concrete: Concrete foundation for posts.

1.03  PRICE AND PAYMENT PROCEDURES
A. See Section 01 2200 - Unit Prices, for additional unit price requirements.
B. Guardrail:
  1. Basis of Measurement: By the linear foot (meter).
  2. Basis of Payment: Includes rail, accessories, end closures, finished.
C. Intermediate Posts:
  1. Basis of Measurement: By the unit.
  2. Basis of Payment: Includes excavating, sleeving through concrete, posts, backfilling and compacting at posts.
D. Terminal Anchor Posts:
  1. Basis of Measurement: By the unit.
  2. Basis of Payment: Includes excavating, sleeving through concrete, posts, anchors and anchor footings, backfilling and compacting at posts.

1.04  REFERENCE STANDARDS
C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

1.05  SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, anchorage, and schedule of components.
C. Product Data: Provide data on rail, posts, accessories, hardware and structural capabilities of rail section.

PART 2  PRODUCTS

2.01  MATERIALS
A. Guardrail Beam: AASHTO M 180 Class A Type I; W profile; rolled steel sections, die punched bolt holes for site assembly and attachment to posts, formed steel curved terminating sections.

2.02  ACCESSORIES
A. Concrete: Type specified in Section 03 3000.
B. Hardware: Steel, bolts, nuts and washers to suit rail profile.
2.03 FINISHES
   A. Components: Galvanized in accordance with ASTM A123/A123M.

PART 3 EXECUTION
3.01 INSTALLATION
   A. Install rails and posts and accessories in accordance with manufacturer's instructions.
   B. Attach rails securely to posts with anchoring hardware.

3.02 TOLERANCES
   A. Posts - Maximum Variation From Plumb: 1/2 inch (12 mm).
   B. Rail - Maximum Offset From True Position: 1 inch (25 mm).
   C. Rail - Maximum Variation From True Height: 1/2 inch (12 mm).
   D. Components shall not infringe adjacent property lines.

END OF SECTION
PART 2 PRODUCTS
1.01 SEED MIXTURE
   A. Seed Mixture:
SECTION 33 4100
SUBDRAINAGE

PART 1 GENERAL
1.01 SECTION INCLUDES
   A. Building Perimeter, Retaining Wall, and Under-Slab Drainage Systems.

1.02 REFERENCE STANDARDS

PART 2 PRODUCTS
2.01 PIPE MATERIALS
   A. Polyvinyl Chloride Pipe: ASTM D2729; plain end, 4 inch (100 mm) inside diameter; with required fittings.
   B. Corrugated Plastic Tubing: Flexible type; 4 inch (100 mm) diameter, with required fittings.
   C. Use perforated pipe at subdrainage system; unperforated through sleeved walls.

2.02 AGGREGATE AND BEDDING
   A. Filter Aggregate and Bedding Material: Granular fill as specified in Section 31 2323.
   B. Filter Sand and Bedding Material: Sand as specified in Section 31 2323.

2.03 ACCESSORIES
   A. Pipe Couplings: Solid plastic.
   B. Joint Covers: No. 15 asphalt saturated roofing felt.
   C. Filter Fabric: Water pervious type, black fiberglass.

PART 3 EXECUTION
3.01 EXAMINATION
   A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

3.02 PREPARATION
   A. Hand trim excavations to required elevations. Correct over-excavation with ________.
   B. Remove large stones or other hard matter that could damage drainage piping or impede consistent backfilling or compaction.

3.03 INSTALLATION
   A. Install and join pipe and pipe fittings in accordance with pipe manufacturer's instructions.
   B. Place drainage pipe on clean cut subsoil.
   C. Lay pipe to slope gradients noted on drawings; with maximum variation from true slope of 1/8 inch (3 mm) in 10 feet (3 m).
   D. Place pipe with perforations facing down. Mechanically join pipe ends.
   E. Install pipe couplings.
   F. Install filter aggregate at sides, over joint covers and top of pipe. Provide top cover compacted thickness of 12 inches (300 mm).
   G. Place filter fabric over levelled top surface of aggregate cover prior to subsequent backfilling operations.
   H. Place aggregate in maximum 4 inch (100 mm) lifts, consolidating each lift.
   I. Refer to Section 31 2323 for compaction requirements. Do not displace or damage pipe when compacting.
   J. Connect to storm sewer system with unperforated pipe, through installed sleeves.
K. Coordinate the Work with connection to municipal sewer utility service, and trenching.

3.04 FIELD QUALITY CONTROL
   A. Section 01 4000 - Quality Requirements: Field inspection and testing.
   B. Request inspection prior to and immediately after placing aggregate cover over pipe.

3.05 PROTECTION
   A. Protect pipe and aggregate cover from damage or displacement until backfilling operation begins.

   END OF SECTION