Invitation to Bid (ITB) 18-102
Athol Maintenance Building
IDAHO TRANSPORTATION DEPARTMENT

Date of Issuance: 4/4/2018
# TABLE OF CONTENTS

## ADMINISTRATIVE INFORMATION

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Purpose</td>
<td>5</td>
</tr>
<tr>
<td>1.2 General Information, Solicitation Instructions and Standard Terms and Conditions</td>
<td>5</td>
</tr>
<tr>
<td>1.3 Inquiries</td>
<td>5</td>
</tr>
<tr>
<td>1.4 Submission Requirements</td>
<td>6</td>
</tr>
<tr>
<td>1.5 Compliance with</td>
<td>6</td>
</tr>
<tr>
<td>1.6 Award</td>
<td>7</td>
</tr>
<tr>
<td>1.7 Point(s) of Contact/Contract Administration</td>
<td>7</td>
</tr>
<tr>
<td>1.8 Pre-Bid Conference</td>
<td>7</td>
</tr>
</tbody>
</table>

## SCOPE OF WORK

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Scope</td>
<td>7</td>
</tr>
<tr>
<td>2.2 Add Alternate Item</td>
<td>8</td>
</tr>
<tr>
<td>2.3 Worksite Cleanup</td>
<td>8</td>
</tr>
<tr>
<td>2.4 Work not noted, detailed, or specified</td>
<td>8</td>
</tr>
<tr>
<td>2.5 Location</td>
<td>8</td>
</tr>
<tr>
<td>2.6 Staging Location(s)</td>
<td>8</td>
</tr>
<tr>
<td>2.7 Safety</td>
<td>8</td>
</tr>
<tr>
<td>2.8 Basis of Payment</td>
<td>8</td>
</tr>
<tr>
<td>2.9 Contract Compliance</td>
<td>9</td>
</tr>
</tbody>
</table>

## GENERAL ARCHITECTURAL AND SPECIAL PROVISIONS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 Subletting/Subcontracting</td>
<td>9</td>
</tr>
<tr>
<td>3.2 Guarantee</td>
<td>9</td>
</tr>
<tr>
<td>3.3 Manufacturer Warrantees and Instruction Sheets</td>
<td>10</td>
</tr>
<tr>
<td>3.4 Temporary Utilities</td>
<td>10</td>
</tr>
<tr>
<td>3.5 Permits</td>
<td>10</td>
</tr>
<tr>
<td>3.6 Codes</td>
<td>10</td>
</tr>
<tr>
<td>3.7 Protection</td>
<td>10</td>
</tr>
<tr>
<td>3.8 Prior Approval</td>
<td>10</td>
</tr>
<tr>
<td>3.9 Submittals</td>
<td>11</td>
</tr>
<tr>
<td>3.10 As – Built Drawings</td>
<td>11</td>
</tr>
<tr>
<td>3.11 Operation, Maintenance Instructions and Manuals</td>
<td>11</td>
</tr>
<tr>
<td>3.12 Dimensions and Measurements</td>
<td>11</td>
</tr>
<tr>
<td>3.13 Coordination and Control</td>
<td>12</td>
</tr>
<tr>
<td>3.14 Use – Tax</td>
<td>12</td>
</tr>
<tr>
<td>3.15 Superintendent</td>
<td>12</td>
</tr>
<tr>
<td>3.16 ITD Use of Building</td>
<td>12</td>
</tr>
<tr>
<td>3.17 Information Given Prior to Award</td>
<td>12</td>
</tr>
<tr>
<td>3.18 Performance</td>
<td>12</td>
</tr>
<tr>
<td>3.19 Bidding Requirements and Conditions</td>
<td>13</td>
</tr>
<tr>
<td>3.20 Irregular Bids</td>
<td>13</td>
</tr>
<tr>
<td>3.21 Disqualification of Bidders</td>
<td>13</td>
</tr>
<tr>
<td>3.22 Bid Guaranty (Five Percent Bid Bond)</td>
<td>14</td>
</tr>
<tr>
<td>3.23 Return of Bid Guaranty (Five Percent Bid Bond)</td>
<td>14</td>
</tr>
<tr>
<td>3.24 Surety Bond Requirements (Performance and Payment Bonds)</td>
<td>14</td>
</tr>
<tr>
<td>3.25 Consideration of Bid / Record of Public Bid Opening (ROPBO)</td>
<td>14</td>
</tr>
<tr>
<td>3.26 Execution / Award of the Contract</td>
<td>14</td>
</tr>
<tr>
<td>3.27 Failure to Execute Contract</td>
<td>15</td>
</tr>
<tr>
<td>3.28 Authority to Proceed</td>
<td>15</td>
</tr>
</tbody>
</table>
4 TERMS AND CONDITIONS ............................................................................................................................................. 15

4.1 Contract Award ....................................................................................................................................................... 15
4.2 Liquidated Damages ............................................................................................................................................... 15
4.3 Payment Requirements .......................................................................................................................................... 15
4.4 Changes ................................................................................................................................................................... 15
4.5 Claims for Adjustment and Disputes ...................................................................................................................... 15
4.6 Force Majeure ......................................................................................................................................................... 16
4.7 Default and Termination of Contract ...................................................................................................................... 16
4.8 Termination for Convenience of the State ............................................................................................................. 16
4.9 Appropriation by Legislature Required ................................................................................................................... 16
4.10 Indemnification ....................................................................................................................................................... 17
4.11 Save Harmless ......................................................................................................................................................... 17
4.12 Insurance requirements .......................................................................................................................................... 17

ATTACHMENT A- BID SCHEDULE ............................................................................................................................... 20

ATTACHMENT B- AFFIDAVIT: DRUG FREE WORKPLACE PROGRAM ........................................................................... 21

ATTACHMENT C- SUBCONTRACTOR LICENSING ......................................................................................................... 22

ATTACHMENT C- SIGNATURE PAGE ............................................................................................................................ 23
## ADMINISTRATIVE INFORMATION

<table>
<thead>
<tr>
<th>ITB Title:</th>
<th>Athol Maintenance Building</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITB Project Description:</td>
<td>Construction of New Maintenance Building in Athol</td>
</tr>
</tbody>
</table>
| ITB Lead: | S. Todd Sorensen, Project Coordinator  
Idaho Transportation Department  
3311 W. State Street, Boise, Idaho 83703  
E-mail: todd.sorensen@itd.idaho.gov  
Phone: 208-334-8093 |
| Submit sealed bid: | Address for Courier  
3311 W. State Street  
Boise, Idaho 83703  
Address for US Mail (if different)  
P.O. Box 7129  
Boise, Idaho 83707-1129 |
| Pre-Bid Conference:  
Pre-Bid Conference Location: | 11:00 a.m. Pacific Time on April 18, 2018  
Athol Maintenance Building US-95  
6306 East Parks Road  
Athol, Idaho 83801 |
| Deadline To Receive Questions: | 5:00 p.m. Mountain Time on April 23, 2018 |
| ITB Closing Date: | 2:00 p.m. Mountain Time on May 1, 2018 |
| ITB Opening Date: | 2:05 p.m. Mountain Time on May 1, 2018 |
| Initial Term of Contract and Renewals (service completion): | The service performed under the contract will begin upon ITD’s written notice to proceed and must be complete within 120 calendar days. |
1 GENERAL INFORMATION

1.1 Purpose

The Idaho Transportation Department (ITD) is requesting bids from qualified bidders to establish a contract between ITD and a Contractor for the construction of a metal fabricated maintenance building, including all mechanical, electrical, HVAC, and plumbing in accordance with the specifications contained herein.

Public Works Licensing is Required

1.2 General Information, Solicitation Instructions and Standard Terms and Conditions

This solicitation is issued by the Idaho Transportation Department via:

http://itd.idaho.gov/business/ (click on the Solicitations – Non-Highway Projects tab). The Idaho Transportation Department is the only contact for this solicitation. All correspondence regarding this ITB must be in writing. In the event that it becomes necessary to revise any part of this ITB, addendums will be posted at the website provide above. It is the responsibility of the bidder to monitor this website for any updates or addendums. Any oral interpretations or clarifications of this ITB will not be relied upon. All changes to this ITB must be in writing and posted to the website to be valid. Alternate bids are not allowed.

The current version of the Idaho Transportation Department, Business & Support Management Solicitation Terms and Conditions are incorporated by reference into this solicitation, and any resulting contract, as if set forth in their entirety. This document can be downloaded at or copies obtained by contacting the solicitation’s lead (see Section 1.3, Inquiries). Failure by any submitting bidder to obtain a copy of these documents will in no way constitute or be deemed a waiver by ITD of any term, condition, or requirement contained in the referenced documents; and no liability will be assumed by ITD for a submitting bidder’s failure to consider the Idaho Transportation Department, Business & Support Management Solicitation Terms and Conditions in preparing its response to the solicitation.

1.3 Inquiries

Questions or other correspondence must be submitted in writing to the ITD contact listed below.

QUESTIONS MUST BE RECEIVED BY 5:00 PM Mountain Time (MT) ON THE DATE LISTED IN THE ADMINISTRATIVE INFORMATION PAGE. Timely received written questions will be answered via an addendum which will be posted to http://itd.idaho.gov/business/ (click on the Solicitations – Non-Highway Projects tab).

ITB Lead: S. Todd Sorensen, Project Coordinator
Phone: 208-334-8093
E-mail: todd.sorensen@itd.idaho.gov

Any questions regarding the Idaho Transportation Department, Business & Support Management Solicitation Terms and Conditions must also be submitted in writing, by the deadline identified in this subsection. ITD will not consider proposed modifications to these requirements after the date and time set for receiving questions. Questions regarding these requirements must contain the following:

1. The rationale for the specific requirement being unacceptable to the party submitting the question (define the deficiency);
2. Recommended verbiage for ITD’s consideration that is consistent in content, context, and form with ITD’s requirement that is being questioned;

3. Explanation of how ITD’s acceptance of the recommended verbiage is fair and equitable to both ITD and to the party submitting the question.

Bids which condition the bid based upon ITD accepting other terms and conditions not found in the ITB, or which take exception to ITD’s terms and conditions, will be found non-responsive, and no further consideration of the bid will be given.

1.4 Submission Requirements

1.4.1 Required Bid Submission Items

Your bid submission must consist of the following:

1.4.1.1 Bid Schedule (Attachment A)
1.4.1.2 Affidavit: Drug Free Workplace Program (Attachment B)
1.4.1.3 Subcontractor Licensing – if applicable (Attachment C)
1.4.1.4 Signature Page (Attachment D)

1.4.2 Bid Submission Methods

Bids must be submitted manually (via U.S. Mail, courier/hand-delivery) in a sealed envelope/package. Do not fax or e-mail your bid. Your bid must be received at the location and by the date and time specified on the ITB Administrative Information Page. The official time, for bid closing purposes, is ITD’s time clock. Alternate bids will not be allowed.

1.4.2.1 Submission Method Requirements

Seal all required bid submission items in a single envelope or package (be certain to include an original hand-written signature in ink OR an electronic digital I.D. on the Signature Page) and label the outside of the package as follows:

Attn: Todd Sorensen, Project Coordinator, Idaho Transportation Department
Bidder Name: (Company Name)
ITB Number: 18-501
ITB Title: Athol Maintenance Building
ITB Closing Date: May 1, 2018

Bidders must provide one (1) original copy of their bid.

1.5 Compliance with

1.5.1 ITD Policy Compliance

The following ITD Policy Compliance applies to this contract when the Contractor is performing work at an ITD facility or when using ITD equipment or other property. These policies will remain in force for the duration of the contract:

5055 Harassment in the Workplace policy
5523 Alcohol and Drug-free Workplace policy
5510 Computer, E-Mail, and Internet Usage policy
5033 Workplace Violence Policy
These policies are and incorporated in this agreement. It is the Contractor’s responsibility to read, understand and comply with these policies; one hundred percent (100%) compliance is mandatory. Furthermore, Contractor is responsible for ensuring that all their employees and subcontractors adhere to these policies. ITD reserves the right to remove from its premises, at any time, any Contractor or his/her employee or subcontractor that fails to follow these policies. ITD also reserves the right to remove its property, at any time, from any Contractor or his/her employee or subcontractor that fails to follow these policies.

All Contractor’s employees and subcontractors are required to wear identification badges at all times while on the ITD’s premises. The Contractor and its employees or subcontractors are not employees of ITD, but ITD retains the right to control its own work place and the use of its property.

If a formal and written complaint is registered with the Contractor in respect to unsatisfactory work performance, the Contractor shall have 72 hours in which to respond in person to the complaint, to remedy the problem(s). Failure to respond in the prescribed time to the complaint or to remedy the problem may result in termination of the contract as provided in the Termination section.

If the district engineer is not satisfied with the results and remediation of the complaint, periodic and joint inspections with the Contractor may be required to discuss and point out contractors violations. Failure of the Contractor to attend these inspections may result in termination of the contract.

1.6 Award
Award will be made, all or none, to the responsive, responsible bidder with the lowest Total Cost, as provided on Attachment A, Bid Schedule.

1.7 Point(s) of Contact/Contract Administration
The contract Administrator(s) and Manager(s) contact information for the resulting contract(s) will be provided upon award of bid.

1.8 Pre-Bid Conference
All interested parties may attend the optional pre-bid conference, at their expense located at 6306 East Parks Road, Athol, Idaho 83801 on April 18, 2018 at 11:00am Pacific Time. Parties interested in attending this conference should notify (in writing) the ITB Lead no later than one (1) business day prior to the date of the pre-bid conference. The written request should specify the name and title of each person who will be attending. A maximum of three (3) persons for each party interested will be allowed to attend in-person.

Failure to attend the optional pre-bid conference will not relieve the bidder of meeting the requirements of this ITB.

2 SCOPE OF WORK

2.1 Scope
This item will consist of the construction of one (1) concrete and riged frame metal type building including all mechanical, electrical and yard improvements as shown on the plans and described in Attachments E,F,G, H and I. In accordance with these specifications the Contractor shall furnish and install all necessary parts and accessories required for complete installation and other items essential for the complete project.
2.2 **Add Alternate Item**

Bidder will supply an Add Alternate No. 01 – Cost to provide a complete Boiler Snow Melt System at the Truck Wash for the exterior concrete slab per the mechanical, plumbing and electrical drawings included as Add Alternate No 01.

2.3 **Worksite Cleanup**

The Contractor must keep work areas free of waste materials. Upon completion of work, all waste, tools, supplies, and materials must be removed from ITD’s premises. Any tools and supplies left onsite after work completion will be considered property of ITD.

2.4 **Work not noted, detailed, or specified**

All work required for complete installation or assembly shall be included in the Contractor’s bid. Where minor portions of required work are not noted, detailed, or specified, such work shall be done in accordance with proven construction practice or accepted industry standards at no additional cost to the owner. The contractor shall be held responsible for verification of existing job conditions prior to bid. No additional cost shall be awarded to the successful contractor (or their subcontractors) after bids have been submitted and contracts awarded for failure to verify existing field conditions. Discrepancies or questions arising between actual field conditions and contract documents must be submitted in accordance with [Section 1.3](#), Inquiries.

2.5 **Location**

Athol Maintenance Building is located on US-95, 6306 East Parks Road, Athol, Idaho 83801

2.6 **Staging Location(s)**

Staging location(s) will be determined by the ITD Contract Manager prior to the start of each project.

2.7 **Safety**

The Contractor must have a comprehensive Safety Manual pertaining to the equipment, material, and process demonstrating capability of safely conducting the work specified in the above solicitation.

2.8 **Basis of Payment**

The Contractor must submit invoices to the ITD billing location provided below, for the quantity delivered and accepted. ITD will render payment for a properly executed invoice according to Idaho Code 67-2302 from the date of the invoice, for pay items accepted by ITD.

Invoices must include the following information:

- Contract Number (and name of project/product, if appropriate)
- Identification of Billing Period.
- Total amount billed for the billing period.
- Detailed description of services/products provided and associated # of hours/$ amounts, as appropriate.
- Name of authorized individual/contact information for Contractor

Invoices must be submitted to:

- D1AP@itd.idaho.gov

2.9 Contract Compliance

If a formal and written complaint is registered with the Contractor in respect to unsatisfactory work performance, the Contractor will have seventy-two (72) hours in which to respond in person to the complaint, to remedy the problem(s). Failure to respond in the prescribed time to the complaint or to remedy the problem may result in termination of the contract as provided in the Idaho Transportation Department, Business & Support Management Solicitation Terms and Conditions.

If ITD is not satisfied with the results and remediation of the complaint, periodic and joint inspections with the Contractor may be required to discuss and point out Contractors violations. Failure of the contractor to attend these inspections may result in termination of the contract.

3 GENERAL ARCHITECTURAL AND SPECIAL PROVISIONS

The Contractor shall supplement the plans for such working drawings as are necessary to adequately control the work. Materials incorporated into this project shall be new and free from defects and of the best commercial quality for the purpose specified.

3.1 Subletting/Subcontracting

[Complete the fillable field if subcontracting is authorized; remove the below (and appendix) if subcontracting is not authorized and state that subcontracting is not authorized for your project.]

The Contractor cannot sublet, sell, transfer, assign, or otherwise dispose of the contract or any portion of the contract, or the right, title, or interest in the contract without the ITD’s written consent. If ITD consents to subletting a portion of the work, the Contractor must use its own organization to perform work amounting to at least thirty percent (30%) of the original contract amount.

If subcontracting is proposed, the bidder must complete Attachment , Subcontractor Licensing, giving the name, address, and Public Works Contractors License Number for any and all companies who will, in the event the bidder secures the contract, complete the plumbing, electrical, or HVAC work under the contract in accordance with Section 67-2310, Idaho Code.

Companies must possess an appropriate Idaho Public Works Contractors License issued by the State of Idaho Public Works Contractors State License Board covering the contract work classification in which they are named.

Note: Section 67-2310, Idaho Code, also states "No general contractor shall name any subcontractor in his bid"

3.2 Guarantee

Excepting where certain portions of the work call for a longer period, all work shall be guaranteed for a minimum period of one year after the date of final acceptance; during the guarantee period, any repairs or replacements required because of defective workmanship or material shall be at the Contractor’s expense.
3.3 Manufacturer Warrantees and Instruction Sheets

Three (3) copies of the manufacturer’s warranties, guarantees, instruction sheets, and parts list for all Contractors’ furnished materials shall be turned over to ITD upon completion of the project.

3.4 Temporary Utilities

The Contractor shall visit the site and determine what measure, if any, will need to be taken to provide for utilities for construction work, which may occur before the time that permanent services will be available.

The contractor shall make arrangements for and furnish at their own expense, all water, sanitary facilities and other utilities necessary for construction purposes. All utilities shall be at the Contractor’s expense until final acceptance.

If existing utilities and sanitary facilities are present at work site location, the Contractor may ask for permission to utilize these services if agency agrees.

3.5 Permits

Pursuant to Section 39-4103 Idaho Code, the Division of Building Safety is responsible for the issuance of building permits and building inspections for construction projects owned by the State of Idaho. This is separate from any required state electrical, plumbing, and mechanical or elevator permits. The contractor shall obtain and pay for all licenses and permits and shall pay fees and charges for connection to outside services to include, water, sewer and electricity and use of public or private property for storage of materials, etc. The Contractor shall comply, without additional expense to ITD, with all State, County and Municipal building ordinances and regulations insofar as the same are binding upon the State. ITD will reimburse the Contractor for utility hookup fees at invoice costs.

3.6 Codes

The Contractor, including subcontractors, shall submit their bid in accordance with plans and specifications. If plans and specifications do not comply with any codes having jurisdiction in that particular place or construction, the Contractor shall notify ITD prior to bidding in writing and faxed to the number stated in the bid document. If prior notification is not given, it shall be assumed that the Contractor’s base bid includes, to the best of their knowledge and experience, all work necessary to comply with such codes.

3.7 Protection

The Contractor shall, at all times, protect building from damage; remove and replace with new work any work damaged by failure to provide protection. Replacement of damaged work will be at no additional cost to ITD.

The Contractor shall provide and maintain dust protection, weather protection and heating as required for the protection of the work from the beginning of the work until final completion, acceptance, or occupancy. Methods and extent of protection and heating shall be subject to the Architect’s approval.

3.8 Prior Approval

The references made to materials equipment, appliances or fixtures in the plans or specifications, where manufactures’ products or brand names are specified, are made to show standards for comparison only as to type, design character, or quality of the article desired, and are not for the purpose of restricting bidders to these products or brand names. The term “or equal” as used herein shall be understood to mean equal to that specified for fulfilling the intended requirements in the judgment of the Architect.
BURDEN OF PROVING THE EQUITY SHALL BE THE CONTRACTOR’S RESPONSIBILITY. The Architect’s decision shall be final. Shop drawings or manufacturer’s literature for the substitute item and for the specified item shall be submitted to support the Contractor’s request on all substitutions.

All requests for approval of change in design of function of materials specified must allow 14 days review time, after receipt of all necessary documents, by the Architect. Approval of submittals shall not relieve the Contractor from responsibility for deviations from the plans or specifications, unless they have, in writing, called the Architect’s attention to deviations at the time of submission, and obtained the Architect’s written approval. Approval of submittals does not relieve the Contractor from responsibility for errors in shop drawings or literature.

3.9 Submittals

A Minimum of one (1) electronic copy submittal is required on all products.

Submittals shall contain the Project name and the following information:

- Date of submission and dates of any previous submissions.
- The names of the contractor, sub-contractor and manufacturer.
- Contractors stamp, initialed or signed, certifying to review of submittal.
- Identification of any deviation from Plans and Specifications.
- Identify each submittal item by specification section, manufacturer, brand, trade name, number, size, rating, or whatever other date is necessary to properly identify and check materials and equipment. The words “as specified” are not sufficient identification.

The Contractor shall submit all required submittals within 30 days of contract signing. Authority to proceed will be given after submittals are approved by the Architect and returned to the Contractor and construction and material delivery schedules are established.

3.10 As – Built Drawings

The Contractor shall provide the Architect with three (3) complete sets of as-built drawings. As-built drawings shall provide detailed and accurate sizes, dimensions and locations of all work items covered under this contract. Contractor shall instruct the separate trades to keep accurate measurements and records of their installation, as the work proceeds. No measurement or payment will be made for as-built drawings, but the cost thereof shall be considered incidental to the items of work under this contract.

3.11 Operation, Maintenance Instructions and Manuals

The Contractor shall train ITD personnel in the general use and maintenance of all installed equipment and accessories. The Contractor shall provide three complete copies of “Operations and Maintenance” manuals for ITD use. The manuals will identify all parts of equipment and show complete wiring diagrams. The manuals will include copies of warranties for all items.

3.12 Dimensions and Measurements

The Contractor shall field verify all dimensions pertaining to the work and shall be responsible for the determination of all quantities of materials required for the work and for the accuracy of all dimensions of materials and items fabricated for this project. The Contractor shall not rely on the scale drawings in the project drawings for the determination of exact quantities or dimensions.
3.13 Coordination and Control

This work shall proceed in an effective sequence so as to eliminate unnecessary work stoppages at the building.

3.14 Use – Tax

It is not anticipated that the Contractor will utilize State-owned material on this project.

In the event that the Contractor does utilize State-owned material, the exercise of control over State-owned material by a Contractor who is improving real property (roadways, etc.) will incur the imposition of a use tax.

Bidders are advised to consult Section 63-3609, Idaho Code, and IDAPA 35, Title 01, Chapter 02, Sales Tax Administrative Rule 012, “Contractors Improving Real Property”, and Rule 013, “Road and Paving Contractors”, or contact the Idaho State Tax Commission for guidance. (Telephone No. (208) 334-7617)

3.15 Superintendent

The Contractor shall employ a competent Foreman and necessary assistants who shall be in attendance at the Project site during the progress of work. The Foreman shall be satisfactory to the Architect, and shall not be changed except with the consent of the Architect unless the Foreman proves to be unsatisfactory to the Contractor and ceases to be in their employ. Under this circumstance, the new Foreman shall also be satisfactory to the Architect. The Foreman shall represent the Contractor and all communications given to the Foreman shall be as binding as if given to the Contractor. Important communications will be confirmed in writing.

3.16 ITD Use of Building

ITD reserves the right to occupy and/or use the building or portions thereof, including portions during the construction period and prior to final acceptance. Such occupancy and/or use shall not constitute acceptance of the Work or any part thereof. The contractor shall take special care to insure that no unnecessary disruptions or normal routines will occur at the project work site. Access to and egress from buildings, grounds, services areas, drives, and streets shall be maintained at all times. Temporary disruptions of building services, equipment, etc. shall be scheduled with ITD. Normal functions shall be restored as quickly as possible.

3.17 Information Given Prior to Award

Oral explanations, instructions and interpretations given to bidders prior to award of contract will not be binding. It is the Department's intent to provide all bidders equal opportunity to access and acquire all available pertinent information necessary to formulate a responsive bid. Any information, specifications, plans, data or interpretations which the Department discovers is lacking and may be important to all bidders, will be furnished to all bidders in the form of an addendum, the receipt of which shall be acknowledged.

3.18 Performance

Submission of a bid by any Contractor shall be accepted as prima facie evidence that they have satisfied themselves as to the nature and location of the work and all other matters, which can in any way affect the work or cost thereof under the contract. Any failure of the Contractor to acquaint them with all available information, including a physical survey of the site of the proposed work, shall not relieve them from successfully performing all the work required.
3.19 **Bidding Requirements and Conditions**

Sealed Bids will be received at the time and place stated on the Cover Page. Timely receipt of Bids will be determined by the date and time the Bid is received at the address specified. Hand delivery is encouraged to ensure timely receipt. **No Bid will be accepted after the time indicated.** All material that is submitted in accordance with this solicitation becomes the property of the State of Idaho and will not be returned.

The bidder shall submit their bid upon the forms furnished by the Department. All figures shall be written in blue ink or typed. Penciled entries will not be accepted. If entries are in pencil, the bid shall be considered irregular and the bid will be rejected.

The bid shall be signed with blue ink by the individual or agency authorized to sign and submit this bid for the bidder. The bid signature page must include the bidder name and address and the state and address in which the business is domiciled.

3.20 **Irregular Bids**

Bids will be considered non-responsive and shall be rejected for the following reasons:

1. If the Bid Form(s) are on a form other than that furnished by the State or if the form is altered or any part thereof is detached.
2. If there are unauthorized additions, conditional or alternate bids, omission of addenda, or irregularities of any kind, which tend to make the bid incomplete, indefinite, or ambiguous as to its meaning.
3. If the bidder adds any provisions reserving the right to accept or reject an award, or to enter into a contract pursuant to an award.
4. If the Bid Schedule does not contain a unit price for each pay item listed except in the case of alternate pay items.
5. If the Bid Documents are not sealed, when received by the Department.
6. If the Signature Page is not signed in blue ink and returned with your bid.
7. If Addendums are not signed, in blue ink, and returned with the Bid Documents.
8. If the required Public Works License Number(s) is not inserted on the ‘Signature Page’.
9. Bidder fails to submit the proper Bid Guaranty as outlined under Subsection 3.23.

3.21 **Disqualification of Bidders**

Any of the following reasons may be considered as being sufficient for the disqualification of a bidder and the rejection of their bid or bids:

1. More than one bid, for the same work from an individual, partnership or corporation under the same name or a different name.
2. Evidence of collusion among bidders. Participants in such collusion will receive no recognition as bidders for any future work of the State until any such participant shall have been reinstated as a qualified bidder.
3. Bidder, or its principals or affiliates, is disbarred, suspended, or ineligible from federal contracting; see Idaho Code § 67-5730 (2) (f).
3.22 Bid Guaranty (Five Percent Bid Bond)

No bid will be considered unless accompanied by a 5% Bid Bond of the character and in an amount not less than the amount indicated on the Bid.

Bid Bonds shall be submitted on the most current version of The American Institute of Architects (AIA) Document 310, signed by the bidder and their surety company. Power of Attorney for the person who executes the bond on behalf of the surety as Attorney-In-Fact must accompany the bid bond.

Guarantees submitted via any other obligation WILL NOT be considered and the bid will be rejected.

Please note: Bonding Surety must be registered and licensed with the Idaho Department of Insurance at the time of bid closing. Bid Guaranty will not be accepted if Surety is not registered and licensed in Idaho, and bid will be deemed non-responsive and rejected.

3.23 Return of Bid Guaranty (Five Percent Bid Bond)

Bid guaranties, except those of the two lowest responsive bidders, will be returned immediately following the opening and checking of the bids. The retained bid guaranty of the unsuccessful of the two lowest responsive bidders will be returned within 10 days following the award of contract and that of the successful bidder will be returned after satisfactory Surety bonds have been furnished and the contract has been executed.

3.24 Surety Bond Requirements (Performance and Payment Bonds)

The lowest responsive, responsible bidder shall furnish a performance bond and a payment bond each in the amount of the contract.

Performance and Payment Bonds shall be submitted on the most current version of The American Institute of Architects (AIA) Document 312, signed by the bidder and their surety company. Power of Attorney for the person who executes the bond on behalf of the surety as Attorney-In-Fact must accompany the bid bond.

Guarantees submitted via any other obligation WILL NOT be accepted.

Please note: Bonding Surety must be registered and licensed with the Idaho Department of Insurance. Performance and Payment bonds will not be accepted if Surety is not registered and licensed in Idaho, and contract will not be executed by the Department. If contractor fails to file acceptable bonds within 5 calendar days after the contract has been received by the bidder, this failure may be deemed just cause for the cancellation of the award of contract and the forfeiture of the proposal guaranty which shall become the property of the state, not as a penalty, but in liquidation of damages sustained.

3.25 Consideration of Bid / Record of Public Bid Opening (ROPBO)

After the bids are opened and read, they will be compared on the basis of the summation of the products of the approximate quantities shown in the bid schedule by the unit bid prices. The results of such comparisons will be available at http://itd.idaho.gov/business/ (click on the Solicitations – Non-Highway Projects tab). The right is reserved to reject any or all bids, to waive technicalities, to advertise for new bids, or to proceed to do the work otherwise, if, in the judgment of the Department, it is in the best interest of the State.

3.26 Execution / Award of the Contract

The award of contract, if it is awarded, will be made within 5 calendar days after the Intent to Award Notice letter has been mailed to the lowest responsive bidder whose bid complies with all requirements prescribed. However, the award may be deferred beyond 5 calendar days by mutual written agreement between the Department and the lowest responsive bidder.
The contract shall be signed by the lowest responsive responsible bidder and returned within 5 calendar days after the bidder has received the contract. If the contract is not executed by the State within 5 calendar days following receipt from the bidder of the signed contracts, the bidder shall have the right to withdraw their bid without penalty. No contract shall be considered as effective until it has been fully executed by all of the parties thereto.

3.27 Failure to Execute Contract

Failure to execute the contract, file acceptable bonds and submit acceptable evidence, if required by contract, of good faith efforts to obtain participation by disadvantaged businesses within 5 calendar days after the contract has been received by the bidder shall be just cause for the cancellation of the award of contract and the forfeiture of the proposal guaranty which shall become the property of the state, not as a penalty, but in liquidation of damages sustained. Award may then be made to the next lowest responsible bidder or the work may be readvertised and constructed under contract or otherwise, as the state may decide.

3.28 Authority to Proceed

Authority to proceed will be given after the required submittals specified in the Special Provisions are received, approved by the Architect and returned to the Contractor and construction and material delivery schedules are established.

4 TERMS AND CONDITIONS

4.1 Contract Award

Contract Award will be ALL OR NONE based on the “TOTAL BID AMOUNT” on the Bid Schedule.

4.2 Liquidated Damages

The amount of Liquidated Damages for failure to complete the work within 120 calendar days will be $300.00 per day.

4.3 Payment Requirements

The Contractor will be paid in accordance with the bid schedule. Payments otherwise due may be withheld on account of substandard or defective work not remedied.

4.4 Changes

The Department reserves the right to revise the “Work Locations and Schedule” and to make other changes within the general Scope of Work as may be deemed necessary to best serve the interests of the Department. Changes in compensation, which may result from such revisions, shall be documented by formal Amendment to the contract and approved by the Contract Administrator.

4.5 Claims for Adjustment and Disputes

If the Contractor believes that additional compensation is due them for work or material not clearly covered in the contract, or not ordered as extra work, as defined herein, they shall prosecute their claim in the following manner.

Prior to doing the work on which they believe additional compensation is due them, the Contractor shall notify the District Engineer, in writing of their intent to file a claim. If such notification is not given, then the Contractor shall thereby waive their right to any claim for such additional compensation.
At a minimum, the detailed letter shall include a narration of events, citing of entitlement and a showing of the amount of compensation and/or adjustment of time believed due. Full documentation for all elements in the letter shall be included. The claim will be considered and a determination made. The District Engineer will notify the Contractor in writing of the decision.

The decision will be final and conclusive unless, within thirty (30) days from receipt of the District Engineer’s letter, the Contractor submits an appeal in writing to the Purchasing Agent. All pertinent information, references, arguments and data to support the claim shall be included. The Purchasing Agent will review the claim and the Contractor will be notified by mail. This decision will be final and conclusive.

In connection with any appeal proceeding under this subsection, the Contractor will be afforded an opportunity to be heard and offer evidence in support of their claim at any level of review. Pending final decision of a dispute hereunder the Contractor shall proceed diligently with performance of the contract.

4.6 **Force Majeure**

Neither party shall be liable or deemed to be in default for any Force Majeure delay in shipment or performance occasioned by unforeseeable causes beyond the control and without the fault or negligence of the parties, including, but not restricted to, acts of God or the public enemy, fires, floods, epidemics, quarantine, strikes, freight embargoes, or unusually severe weather, provided that in all cases the Contractor shall notify the State promptly in writing of any cause for delay and the State concurs that the delay was beyond the control and without the fault or negligence of the Contractor. The period for the performance shall be extended for a period equivalent to the period of the Force Majeure delay. Matters of the Contractor’s finances shall not be a Force Majeure.

4.7 **Default and Termination of Contract**

Should the Contractor neglect to prosecute the work properly, or fails to perform any provision of the contract, the Department, after seven (7) days from written notice to the Contractor, may without prejudice to any other remedy they may have, make good the deficiencies and may deduct the cost thereof from the payment then or thereafter due to the Contractor or, at its option, may terminate the contract and take possession of all materials, tools, fixtures and furnish the work by such means as the Department sees fit, and if the unpaid balance of the contract price exceeds the expense of finishing the work, such excess shall be paid to the Contractor, but if such expense exceeds such unpaid balance, the Contractor’s surety shall pay the difference to the Department.

4.8 **Termination for Convenience of the State**

The performance of work under this contract may be terminated by the state in accordance with this subsection in whole, or from time to time in part, whenever it shall be determined that such termination is in the best interest of the state. Any such termination shall be effected by delivery to the Contractor of a Notice of Termination specifying the extent to which performance of work under the contract is terminated, and the date upon which such termination becomes effective.

4.9 **Appropriation by Legislature Required**

The State is a government entity and this Agreement shall in no way or manner be construed so as to bind or obligate the State of Idaho beyond the term of any particular appropriation of funds by the State's Legislature as may exist from time to time. The State reserves the right to terminate this Agreement in whole or in part (or any order placed under it) if, in its sole judgment, the Legislature of the State of Idaho fails, neglects, or refuses to appropriate sufficient funds as may be required for the State to continue such payments, or requires any return or “give-back” of funds required for the State to continue payments, or if the Executive Branch
mandates any cuts or holdbacks in spending. All affected future rights and liabilities of the parties hereto shall thereupon cease within ten (10) calendar days after notice to the Contractor. It is understood and agreed that the State’s payments herein provided for shall be paid from Idaho State Legislative appropriations.

4.10 Indemnification

The Contractor shall indemnify, save harmless, and defend regardless of outcome, the State from the expenses of and against all suits, actions, claims, or costs, expenses, and attorney fees that may be incurred because of any injuries or damages received or sustained by any person, persons, or property on account of the operations of the Contractor or their subcontractors; or on account of or in consequence of any neglect in safeguarding the work; or through use of unacceptable materials in the work; or because of any act or omission, neglect, or misconduct of the Contractor or their subcontractors; or because of any claims or amounts recovered from any infringements of patent, trademark, or copyright; or from any claims or amounts arising or recovered under the Worker's Compensation Act or any other law, ordinance, order or decree.

4.11 Save Harmless

The Contractor shall exonerate, indemnify, and hold the Department harmless from and against and assume full responsibility for payment of all federal, state and local taxes or contributions imposed or required under unemployment insurance, social security, workman's compensation, and income tax laws with respect to the Contractor or the Contractor's employees engaged in the performance of this Agreement.

The Contractor will maintain Worker’s Compensation Insurance as required by Idaho Code and will provide to the department a certificate of Idaho Worker’s Compensation Insurance issued by a surety licensed to write Idaho Worker’s Compensation in the State of Idaho, or an extraterritorial certificate approved by the Idaho Industrial Commission from a State that has a current reciprocity agreement with the Idaho Industrial Commission. Failure to provide a Certificate of Workman's Compensation Insurance may result in a price adjustment to cover any cost to the Department of providing the necessary workman’s compensation insurance. The Department will not assume liability as an employer.

The Contractor shall protect, indemnify, and save the Department harmless from and against any damage, cost, or liability including reasonable attorney's fees for any or all injuries to persons, property or claims for damages arising from any acts or omissions of the Contractor, its employees, or subcontractors.

It is agreed by and between the parties hereto that in no event shall any official, officer, employee or agent of the Department be in any way personally liable or responsible for any covenant or agreement herein contained whether expressed or implied, nor for any statement, representation or warranty made herein or in any connection with this Agreement.

4.12 Insurance requirements

Within fifteen (5) calendar days of notification of award (or such other time as designated by the Purchasing Activity), the apparent successful bidder must provide certificates of insurance required herein and must maintain the insurance during the life of the Contract. There are no provisions for exceptions to this requirement. Failure to provide the certificates of insurance within the fifteen (5) calendar day period may be cause for your bid to be declared non-responsive or for your contract to be cancelled.

The Contractor must carry liability and property damage insurance that will protect it and the State of Idaho from claims for damages for bodily injury, including accidental death, as well as for claims for property damages, which may arise from operations under the Contract whether such operations be by themselves or by anyone directly or indirectly employed by either of them.
The Contractor cannot commence work under the Contract until it obtains all insurance required under this provision and furnishes a certificate or other form showing proof of current coverage to the State. All insurance policies and certificates must be signed copies. After work commences, the Contractor must keep in force all required insurance until the contract is terminated.

4.12.1 Commercial General and Umbrella Liability Insurance.

Contractor must maintain Commercial General Liability (CGL) and, if necessary, Commercial Umbrella insurance with a limit of not less than $2,000,000 each occurrence. If such CGL insurance contains a general aggregate limit, it must apply separately to this Contract. For Comprehensive or Commercial General Liability insurance policy containing an aggregate limit, ensure a limit of at least $4,000,000. The above limits may be met by policies having limits such as $1,000,000 per occurrence, $2,000,000 aggregate plus an umbrella policy of $2,000,000.

CGL insurance must be written on ISO occurrence form CG 00 01 (or a substitute form providing equivalent coverage) and must cover liability arising from premises, operations, independent contractors, products-completed operations, personal and advertising injury, and liability assumed under an insured contract (including the tort liability of another assumed in a business contract).


The Contractor must maintain Commercial Automobile Liability and, if necessary, Commercial Umbrella Liability insurance with a limit of not less than $2,000,000 each accident. Such insurance must cover liability arising out of any auto (including owned, hired, and non-owned autos).

Bidders may request a waiver from providing Commercial Automobile and Commercial Umbrella Liability Insurance in its bid if the bidder will not use any owned, hired or non-owned vehicles to conduct business under the contract, if it is awarded the contract, and the State of Idaho will consider the request. If the bidder submits a request to waive the provision of Commercial Automobile and Commercial Umbrella Liability Insurance after the due date and time for receipt of bids or proposals, the State of Idaho may not consider the request.

4.12.3 Workers Compensation Insurance and Employer's Liability.

The Contractor must maintain workers compensation and employer's liability. The employer's liability must have limits not less than $500,000 each accident for bodily insurance by accident or $500,000 each employee for bodily injury by disease.

The Contractor must provide either a certificate of workers compensation insurance issued by a surety licensed to write workers compensation insurance in the State of Idaho, as evidence that the Contractor has in effect a current Idaho workers compensation insurance policy, or an extraterritorial certificate approved by the Idaho Industrial Commission from a state that has a current reciprocity agreement with the Idaho Industrial Commission.

4.12.4 State of Idaho as Additional Insured.

The liability insurance coverage required for performance of the Contract must include the State of Idaho, the (agency) and its divisions, officers and employees as additional insured, but only with respect to the Contractor’s activities to be performed under this Contract.
The Contractor must provide proof of the State of Idaho, the (agency) and its divisions, officers and employees being additional insured by providing endorsements to the liability insurance policies showing the State of Idaho, the (agency) and its divisions, officers and employees as additional insured. The endorsements must also show the policy numbers and the policy effective dates.

If a liability insurance policy provides for automatically endorsing additional insured when required by contract, then, in that case, the Contractor must provide proof of the State of Idaho, the (agency) and its divisions, officers and employees being additional insured by providing copies of the policy pages that clearly identify the blanket endorsement.

4.12.5 Notice of Cancellation or Change.

The Contractor must ensure that should any of the above described policies be cancelled before the expiration date thereof, or if there is a material change, potential exhaustion of aggregate limits or intent not to renew insurance coverage(s), that written notice will be delivered to the ITD in accordance with the policy provisions.

4.12.6 Failure to Comply.

The Contractor must further ensure that all policies of insurance are endorsed to read that any failure to comply with the reporting provisions of this insurance, except for the potential exhaustion of aggregate limits, will not affect the coverage(s) provided to the State of Idaho, and its divisions, officers and employees.

4.12.7 Acceptable Insurers and Deductibles.

Insurance coverage required under the Contract must be obtained from insurers rated A-VII or better in the latest Bests Rating Guide and in good standing and authorized to transact business in Idaho. The Contractor must be financially responsible for all deductibles, self-insured retention’s and/or self-insurance included hereunder. The coverage provided by such policy will be primary to any coverage of the State on or related to the contract and must provide that the insurance afforded applies separately to each insured against whom a claim is made, except with respect to the limitation of liability.

4.12.8 Waiver of Subrogation.

All policies must contain waivers of subrogation. The Contractor waives all rights against the State and its officers, employees, and agents for recovery of damages to the extent these damages are covered by the required policies. Policies may contain deductibles but such deductibles will not be deducted from any damages due to the State.
ATTACHMENT A- BID SCHEDULE

ITB 18-102 Athol Maintenance Building

Company Name of Bidder: ______________________________________________________

Contact Name/Phone: _______________________________________________________

Contact E-mail: ______________________________________________________________

The bid item shall be filled in completely by the bidder in the bid schedule, by indicating total dollars and cents under the Total Cost Bid. All costs, including hourly rates will be included here and will be fully burdened to include; but not limited to, wages, transportation, lodging, overhead, and per-diem.

All of the items shown or noted on the plans or in these specifications, which are not specifically a bid item, are considered incidental items. The cost of furnishing and installing all incidental items will not be paid for separately, but shall be included in the contract unit prices as bid, unless otherwise noted.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>UNIT PRICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>construction of a metal fabricated maintenance building in Athol, Idaho</td>
<td>$___________</td>
</tr>
<tr>
<td>2</td>
<td>Bidder will supply an Add Alternate No. 01 – Cost to provide a complete Boiler Snow Melt System at the Truck Wash for the exterior concrete slab per the mechanical, plumbing and electrical drawings included as Add Alternate No 01.</td>
<td>$___________</td>
</tr>
</tbody>
</table>

| TOTAL COST | $___________ |

THIS ATTACHMENT MUST BE COMPLETED AND RETURNED WITH RESPONSE
ATTACHMENT B- AFFIDAVIT: DRUG FREE WORKPLACE PROGRAM

ITB 18-102 Athol Maintenance Building

STATE OF ____________________________
COUNTY OF __________________________

The undersigned being duly sworn upon oath deposes and says that _____________________________
(Contractor Name)

complies with the provisions of Section 72-1717 Idaho Code (Drug Free Workplace program); that
_____________________________ provides a drug-free workplace program that complies with the
(Contractor Name)
provisions of Idaho Code, Title 72, Chapter 17 and will maintain such program throughout the life this contract
and that ___________________________ will subcontract work only to
(Contractor Name)
subcontractors meeting the requirements of Idaho Code, section 72-1717(1)(a).

_____________________________
Name of Contractor

_____________________________
Address

_____________________________
City and State

By: ____________________________
(Signature)

Subscribed and sworn to before me this __________ day of ______________, in the year __________.
Commission expires: ______________

_______________________________________
NOTARY PUBLIC, residing at

_______________________________________

_______________________________________

THIS ATTACHMENT MUST BE COMPLETED AND RETURNED WITH RESPONSE
ATTACHMENT C- SUBCONTRACTOR LICENSING

ITB 18-102 Athol Maintenance Building

Provide the names, addresses, public works contractor license numbers, and contract amounts of the Contractor or Subcontractor(s) who will do the plumbing, electrical, or HVAC work under the contract.

A. Plumbing work by: _______________________________________ residing at:

_________________________________, whose Idaho Public Works Contractors License No. is: _________________.

whose State Plumbing Bureau License No. is: _________________. Amount: $_______________

B. Electrical work by: _______________________________________ residing at:

_________________________________, whose Idaho Public Works Contractors License No. is: _________________.

whose State Electrical Bureau License No. is: _________________. Amount: $_______________

C. HVAC work by: _______________________________________ residing at:

_________________________________, whose Idaho Public Works Contractors License No. is: _________________.

whose HVAC License No. is: _________________. Amount: $_______________

THIS ATTACHMENT MUST BE COMPLETED AND RETURNED WITH RESPONSE IF SUBCONTRACTING
ATTACHMENT C- SIGNATURE PAGE

Idaho Transportation Department  
P.O. Box 7129  
Boise, Idaho 83707-1129

**SIGNATURE PAGE for Use with a Submitted ITB Response**

Bids and pricing information must be typewritten or handwritten in ink. Originals and copies of the bid must be submitted in accordance with the solicitation documents. Submitted bids must include this signature page with the **ORIGINAL** signature (ink or electronic digital I.D.) of an individual authorized to bind of the submitting bidder.

NO LIABILITY WILL BE ASSUMED BY THE IDAHO TRANSPORTATION DEPARTMENT FOR A BIDDER’S FAILURE TO OBTAIN THE TERMS AND CONDITIONS AND ANY PROPERLY ISSUED SOLICITATION ADDENDUMS IN A TIMELY MANNER FOR USE IN THE BIDDER’S RESPONSE TO THIS SOLICITATION OR ANY OTHER FAILURE BY THE BIDDER TO CONSIDER THE TERMS, CONDITIONS, AND ANY ADDENDUMS IN THE BIDDER’S RESPONSE TO THE SOLICITATION.

Send your sealed bid package to:   
Idaho Transportation Department  
ATTN:  S. Todd Sorensen  
PO Box 7129  
Boise, Idaho 83707-1129

OR

FedEx, UPS, or other Couriers:

Idaho Transportation Department  
ATTN:  S. Todd Sorensen  
3311 W. State Street  
Boise, Idaho 83703

This ITB or IBR response is submitted in accordance with all documents and provisions of the specified Bid Number and Title detailed below. By my signature below I accept the terms, conditions, and requirements contained in the solicitation in effect at the time this ITB or IBR was issued, as incorporated by reference into this solicitation. As the undersigned I certify I am authorized to sign and submit this response for the named bidder. I further acknowledge I am responsible for reviewing and acknowledging any addendums that have been issued for this solicitation.

Bid Number: ITB 18-102  
Bid Title: Athol Maintenance Building

Bidder (Company Name): __________________________________________________________________________________

ADDRESS: _______________________________________________________________________________________________

CITY, ST, ZIP: ____________________________________________________________________________________________

PHONE: ________________________ FAX: _________________________ EMAIL: ____________________________________

PUBLIC WORKS LICENSE NO:___________________________           FEIN:______________________________________

THIS SIGNATURE PAGE MUST BE SIGNED WITH AN ORIGINAL HANDWRITTEN SIGNATURE (PREFERABLY IN BLUE INK) OR AN ELECTRONIC DIGITAL I.D., AND RETURNED WITH YOUR BID FOR YOUR BID TO BE CONSIDERED.

_________________________________________________  _____________________________________
Original Signature (in ink or electronic digital I.D.)    Date

_________________________________________________  _____________________________________
Printed Name        Title
SPECIFICATIONS

NEW
MAINTENANCE BUILDING
ATHOL, IDAHO

Project #
for

Idaho Transportation Department
P.O. Box 7129
Boise, Idaho 83707

Architect:
Hutchison Smith Architects
270 N. 27th St., Suite A
Boise, ID 83702

Owner:
Idaho Transportation Department
P.O. Box 7129
Boise, Idaho 83707

HSA #16.118
SPECIFICATIONS

NEW MAINTENANCE BUILDING
ATHOL, IDAHO

For

Idaho Transportation Department

P.O. Box 7129
Boise, Idaho 83707

DATE: SEPTEMBER 2017

ARCHITECT
Hutchison Smith Architects
270 N. 27TH St., Suite 200
Boise, ID 83702
Contact: Don Hutchison
Tel: (208)338-1212

MECHANICAL ENGINEER
Nielson Engineering
156 N 12th Ave.
Pocatello, ID 83201
Contact: Gordon Nielson
Tel: (208) 232-2577

ELECTRICAL ENGINEER
Bradley Engineering/Chtd.
645 W. 25th Street
Idaho Falls, ID 83402
Contact: Matthew N. Bradley, P.E.
Tel: (208) 523-2862 Fax: (208)523-2864
TABLE OF CONTENTS

DIVISION 1 - GENERAL REQUIREMENTS
Soils Report
Envelope Compliance Certificate 9/20/17
01100 Summary
01250 Contract Modification Procedures
01290 Payment Procedures
01310 Project Management and Coordination
01320 Construction Progress Documentation
01330 Submittal Procedures
01500 Temporary Facilities and Controls
01635 Substitution Procedures
01770 Closeout Procedures
01781 Project Record Documents
01782 Operation and Maintenance Data

DIVISION 2 - SITE WORK
Site Clearing by ITD
Asphalt Work by ITD
02300 Earthwork
02751 Cement Concrete Paving

DIVISION 3 – CONCRETE
03300 Cast-In-Place Concrete

DIVISION 4 – MASONRY (NOT USED)

DIVISION 5 – METAL
05500 Metal Fabrication

DIVISION 6 - WOOD & PLASTIC
06100 Rough Carpentry
06160 Sheathing
06402 Interior Architectural Woodwork
06640 Plastic Paneling

DIVISION 7 - THERMAL & MOISTURE PROTECTION
07210 Building Insulation
(See 13125 for Metal Building Insulation & Roofing)
07728 Snow Guards
07920 Joint Sealants

DIVISION 8 - DOORS AND WINDOWS
08110 Steel Door and Frame
08361 Sectional Overhead Doors
08561 Vinyl Windows
08710 Door Hardware
08800 Glazing
### DIVISION 9 – FINISHES
- 09221 Non Structural Metal Framing
- 09250 Gypsum Board
- 09650 Resilient Flooring
- 09653 Resilient Wall Base and Accessories
- 09911 Exterior Painting
- 09912 Interior Painting

### DIVISION 10 – SPECIALTIES
- 10434 Panel Signage
- 10801 Toilet and Bath Accessories

### DIVISION 11 – EQUIPMENT
- 11000 Lubrication System

### DIVISION 12 – FURNISHING (NOT USED)

### DIVISION 13 - SPECIAL CONSTRUCTION
- 13125 Metal Building Systems

### DIVISION 14 - CONVEYING SYSTEM
- 14000 Bridge Crane

### DIVISION 15 – MECHANICAL
- 15010 General Mechanical Requirements
- 15030 Electrical Provisions of Mechanical Work
- 15060 Pipe and Pipe Fittings
- 15070 Motors
- 15190 Mechanical Identification
- 15261 Culinary Water Pipe Insulation
- 15430 Plumbing Specialties
- 15440 Plumbing Fixtures
- 15450 Vibration and Seismic Control for HVAC Piping and Equipment
- 15453 Handicap Drinking Water Cooling System
- 15459 Gas Fired Storage Type Water Heaters
- 15481 Compressed Air System
- 15489 Natural Gas Systems
- 15530 Refrigerant Piping Systems
- 15535 Refrigerant Specialties
- 15611 Gas Fired Furnaces (90%)
- 15622 Combustion and Exhaust Air Piping
- 15623 Gas Unit Heater
- 15625 Make-Up Air Units
- 15640 Flues
- 15647 Electric Radiant Wall and Ceiling Heaters
- 15675 Air-Cooled Heat Pump Units
- 15869 Exhaust Fans
- 15887 Disposable Filters
- 15890 Low-Pressure Steel Ductwork
- 15892 Non Metal Ductwork
- 15896 Duct Lining
15911  Fire and Fire/Smoke Dampers
15940  Air Outlets and Inlets
15970  Control Systems
15985  Sequence of Operation

**DIVISION 16 – ELECTRICAL**
16000  Electrical General
16050  Basic Materials & Methods
16400  Service & Distribution
16500  Lighting
16700  Communications

**INDEX OF DRAWINGS**

**GENERAL**
A0.0    Cover Sheet
A0.1    Envelope Compliance Cert.

**ARCHITECTURAL**
A1.0    Site Plan
A1.1    Partial Enlarged Site Plan
A2.0    Floor Plan – 5 Bay, Room Finish Schedule
A2.1    Door Schedule, Door & Window Types & Details
A2.2    Partial Floor Plans, Interior Elevations and Details
A2.3    General Structural Notes & Shear Wall Schedule
A2.4    Foundation Plan and Details
A2.5    Foundation Details
A3.0    Exterior Elevations
A3.1    Exterior Elevations and Details
A4.0    Building Section and Details
A4.1    Partial Sections and Details
A4.2    Building Section at Crane Bay and Details

**MECHANICAL**
M0.0    Mechanical Cover Sheet
M0.1    Mechanical Schedules
M1.0    Foundation Plan – Plumbing
M2.0    Floor Plan – Plumbing & HVAC
M3.0    Mechanical Details
M4.0    Mechanical Plans and Details

**ELECTRICAL**
E0.1    Electrical Title Sheet
E0.2    Electrical Site Plan
E1.1    Lighting Plans – Lighting Compliance – Fixture Schedule
E1.2    Lighting Control Panel, Elevations
E2.1    Power Plan
E3.1    Mechanical Power Plans
E4.1    Electrical Details

**END OF TABLE OF CONTENTS**
DATE: November 7, 2017

TO: DAMON ALLEN, P.E.
    DISTRICT ENGINEER

FROM: CHARLIE WHILE, P.G.
      DISTRICT DISTRICT GEOLOGIST

RE: MATERIALS PHASE IV FOUNDATION INVESTIGATION APPROVAL

We request your final approval of the Materials Phase IV Foundation Investigation Report for the proposed Athol Maintenance Building at KT-110s, dated November 7, 2017.

Report Prepared By:

[Signature]  
District Geologist

Reviewed by:

[Signature]  
Materials Engineer

Approved by:

[Signature]  
District Engineer

Date: 11-7-17

250.1 INTRODUCTION
This project consists of constructing a 54’ by 118’ high-bay maintenance building at the Athol Gravel Pit, KT-110s. The proposed design consists of four truck-maintenance bays with two levels of office/crew room and storage areas in the northern portion of the building and an exterior truck wash area on the south side of the building.

The Athol Gravel Pit is located in an area containing thick glacial flood deposits of clean sand and gravel. The proposed building site has historically been used for sand and gravel mining and materials stockpiling for many years and is underlain by a depth of backfilled primary rejects consisting of ½-inch minus natural sand and gravel from crushing operations within the pit. District maintenance crews have prepared the building site by removing, moisture conditioning and re-compacting the upper 5 to 9 feet of sand and gravel materials below footing bearing level within the building footprint plus 15 feet beyond. Bearing for the foundations will be within medium dense to dense, gravelly sand and sandy gravels.

250.2 FIELD EXPLORATION AND LABORATORY TESTING

250.2.1 Test Pits
Three test pits were completed in the area of the proposed building during 2015 utilizing a rubber-tire backhoe. The District Geologist logged the materials encountered. The test pits were excavated to depths of 9 to 13 feet.

250.2.2 Field Tests
Field testing was not performed

250.2.3 Geophysical Exploration
Geophysical testing was not performed

250.2.4 Laboratory Tests
Laboratory testing was not performed. The soils encountered in the test pits were classified in the field.

250.3 SURFACE CONDITIONS
The building site is south of an existing maintenance building in the southeast quadrant of the materials source KT-110s parcel. The site is relatively flat, sloping very gently to the south. The rim of a 30 to 40-foot deep gravel pit is located approximately 100 feet west of the building site. The site is essentially devoid of vegetation.
250.4 SUBSURFACE CONDITIONS
The subsurface soils within the proposed building area consist of medium dense to dense, clean granular soils with gravel, cobbles and boulders. The upper 5 to 9 feet of soils below footing bearing level were recently removed, moisture conditioned and replaced as compacted fill. All organics, fine-grained soils and deleterious materials encountered were selectively removed from the area during the remedial grading work. Below the re-compacted zone, the granular soils are dry to slightly moist and easily excavated. Caving of steep sided excavations will be a concern and will require excavation support to provide safe, stable workings. The depth to groundwater is in excess of 200 feet below the surface.

250.5 CONCLUSIONS AND RECOMMENDATIONS

250.5.1 General
The proposed maintenance building is a 54’ by 118’, high-bay structure with four truck-maintenance bays, two levels of office/crew room and storage areas in the northern portion of the building and an exterior truck wash area on the south side of the building. Shallow spread footings are recommended. The building site is underlain by compacted, granular soils so settlement should be minimal and occur quickly.

250.5.2 Foundations
250.5.2.1 Spread Footings
Spread footings may be either individual or continuous. The estimated allowable bearing capacity is 2.5 ton/ft² based upon a minimum 3 foot wide footing with a minimum embedment of 3 feet below finish grade for frost protection. The estimated coefficient of friction between the bottom of the footing and the foundation soil is 0.45.

The estimated soil properties for designing the foundations are:

- Unit Weight = 125 pcf
- Internal Friction Angle = 34°

250.5.2.2 Deep Foundations
Deep foundations are not recommended for this site due to granular nature of the soils and expense of a shaft or pile style foundation.

250.5.3 Lateral Pressures and Backfill
Lateral earth pressures are not required for this project. All backfill material should be granular material.

250.5.4 Anchors
Anchors are not required for this project.
250.5.5 Drainage
The surface should be graded to drain away from the building but anti-icing brine runoff will need to be controlled.

250.5.6 Embankments
Embankments are not required for this project.

250.5.7 Erosion Control
Standard erosion control measures will be required.

250.5.8 Seismic Design
Based on Figure 630.04.01 of the ITD Materials Manual, the Peak Ground Acceleration Coefficient for this project is 0.10 (10% of gravity). Figure 630.05.01 shows the closest active fault to be located in the northwestern Montana about 45 miles from the project.

The general soil profile for the project area is characterized as medium dense to dense, granular soils several hundred feet deep with ground water in excess of 200 feet deep. Liquefaction potential and seismic settlement in the project area is low due to the low seismic acceleration values, the relatively dense nature of the underlying sand, gravel and cobble soils, and the substantial depth to groundwater.

250.5.9 Construction
Open excavations shall be supported or sloped to 1.5H (horizontal) to 1.0V (vertical) to meet OSHA safety standards.

250.6 ILLUSTRATIONS
A site plan and building plan are attached.

250.7 APPENDIX
Test pit logs are attached.
Crusher Rejects; Typical 1/2” minus primary crusher reject; Loose to Med Dense Poorly Graded, Subrounded Fine GRAVEL with subangular coarse Sand; Generally Clean with variable amounts of Silt; Gray to Brown; Moist. Small lense of Sandy Coarse Gravel in west end of pit near 11 feet.

Test Pit Stood open overnight with limited caving due to apparent cohesion as moisture.

Bottom of test pit at 13.0 feet.
<table>
<thead>
<tr>
<th>DEPTH (ft)</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Crusher Rejects; GM to GP; Typical 1/2&quot; minus primary crusher reject; Loose, Subrounded Fine Gravel with Subangular to Subrounded Coarse Sand with Silt; Gray to Brown; Moist.</td>
</tr>
<tr>
<td>5</td>
<td>Old Asphalt Mixing Floor at 4', about 6&quot;- 8&quot; thick; Asphalt mixed with Sand and Fine Gravel overlying Fine Clean Gravel (Rejects?); Black. Loose, Poorly Graded Coarse SAND some coarse Gravel (Rejects?); Gray; Moist.</td>
</tr>
<tr>
<td>10</td>
<td>Med. Dense Silty GRAVEL with Cobbles, probable native material; Brown; Moist.</td>
</tr>
<tr>
<td>11.0</td>
<td>Loose to Med Dense, Clean, Poorly Graded, Subrounded Fine GRAVEL with subangular coarse Sand and some Cobbles.</td>
</tr>
</tbody>
</table>

Bottom of test pit at 11.0 feet.
<table>
<thead>
<tr>
<th>DEPTH (ft)</th>
<th>SAMPLE TYPE NUMBER</th>
<th>BLOW (N VALUE)</th>
<th>GRAPHIC LOG</th>
<th>MATERIAL DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>0.80</td>
<td></td>
<td>Sanding Materials, Grass, Gravel Mix.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.50</td>
<td></td>
<td>Asphalt Roadmix Mixing Floor at 0.6'; Fine Gravel to Coarse Sand mixed with liquid asphalt, some chunks of asphalt roadmix.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6.00</td>
<td></td>
<td>Loose to Med. Dense, Poorly Graded GRAVEL with Cobbles to Silty GRAVEL with Cobbles; Assumed to be native Gravels; Subrounded Gravel and Subangular to Subrounded Coarse Sand; Brown; Moist.</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>9.00</td>
<td></td>
<td>Loose to Med Dense, Poorly Graded Coarse SAND with Gravel and Cobbles; Clean, Subrounded Coarse Sand; Brown; Moist.</td>
</tr>
</tbody>
</table>

Bottom of test pit at 9.0 feet.
# Envelope Compliance Certificate

## Project Information
- **Energy Code:** 90.1 (2010) Standard
- **Project Title:** New Athol ITD Maintenance Building
- **Location:** Athol, Idaho
- **Climate Zone:** 5b
- **Project Type:** New Construction
- **Vertical Glazing / Wall Area:** 2%

## Construction Site
- **Owner/Agent:** Idaho Department of Transportation
- **Designer/Contractor:**
  - Joe Presher
  - Hutchison-Smith Architects
  - 270 North 27th Street
  - Boise, ID 83702
  - 208 338 1212
  - joe@hsaarchitect.com

## Building Area
- **Floor Area:** 7668

## Envelope Assemblies

<table>
<thead>
<tr>
<th>Assembly</th>
<th>Gross Area or Perimeter</th>
<th>Cavity R-Value</th>
<th>Cont. R-Value</th>
<th>Proposed U-Factor</th>
<th>Budget U-Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof 1: Metal Building, Standing Seam, Double Insulation Layer with Thermal Blocks (d), [Bldg. Use 1 - Transportation]</td>
<td>6144</td>
<td>38.0</td>
<td>0.0</td>
<td>0.046</td>
<td>0.055</td>
</tr>
<tr>
<td>Floor 1: Slab-On-Grade: Unheated, Horizontal with vertical 2 ft., [Bldg. Use 1 - Transportation] (c)</td>
<td>338</td>
<td>---</td>
<td>10.0</td>
<td>0.700</td>
<td>0.540</td>
</tr>
</tbody>
</table>

### NORTH
- Exterior Wall 3: Solid Concrete: 6" Thickness, Normal Density, Furring: Wood, [Bldg. Use 1 - Transportation] | 180                     | 25.0           | 0.0           | 0.051            | 0.090          |
- Exterior Wall 3 with 2x4 Furring to 8' A.F.F.: Metal Building Wall, Unspecified, [Bldg. Use 1 - Transportation] | 324                     | 40.0           | 0.0           | 0.048            | 0.069          |
- Window 7: Vinyl/Fiberglass Frame: Operable, Perf. Specs.: Product ID WWD-A-15-00016-00001, SHGC 0.30, PF 0.17, VT 0.57, [Bldg. Use 1 - Transportation] (b) | 16                      | ---            | ---           | 0.320            | 0.350          |
- Window 8: Vinyl/Fiberglass Frame: Operable, Perf. Specs.: Product ID WWD-A-15-00016-00001, SHGC 0.30, PF 0.17, VT 0.57, [Bldg. Use 1 - Transportation] (b) | 16                      | ---            | ---           | 0.320            | 0.350          |
- Exterior Wall 3: Metal Building Wall, Unspecified, [Bldg. Use 1 - Transportation] | 740                     | 25.0           | 0.0           | 0.058            | 0.069          |

### EAST
- Exterior Wall 2: Solid Concrete: 6" Thickness, Normal Density, Furring: Wood, [Bldg. Use 1 - Transportation] | 234                     | 25.0           | 0.0           | 0.051            | 0.090          |
- Exterior Wall 2 with 2x4 Furring to 8' A.F.F. copy 1: Metal Building Wall, Unspecified, [Bldg. Use 1 - Transportation] | 713                     | 40.0           | 0.0           | 0.048            | 0.069          |
<table>
<thead>
<tr>
<th>Assembly</th>
<th>Gross Area or Perimeter</th>
<th>Cavity R-Value</th>
<th>Cont. R-Value</th>
<th>Proposed U-Factor</th>
<th>Budget U-Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Window 2: Vinyl/Fiberglass Frame: Operable, Perf. Specs.: Product ID WWD-A-15-00016-00001, SHGC 0.30, PF 0.17, VT 0.57, [Bldg. Use 1 - Transportation] (b)</td>
<td>16</td>
<td>---</td>
<td>---</td>
<td>0.320</td>
<td>0.350</td>
</tr>
<tr>
<td>Window 3: Vinyl/Fiberglass Frame: Operable, Perf. Specs.: Product ID WWD-A-15-00016-00001, SHGC 0.30, PF 0.17, VT 0.57, [Bldg. Use 1 - Transportation] (b)</td>
<td>16</td>
<td>---</td>
<td>---</td>
<td>0.320</td>
<td>0.350</td>
</tr>
<tr>
<td>Window 4: Vinyl/Fiberglass Frame: Operable, Perf. Specs.: Product ID WWD-A-15-00016-00001, SHGC 0.30, PF 0.17, VT 0.57, [Bldg. Use 1 - Transportation] (b)</td>
<td>16</td>
<td>---</td>
<td>---</td>
<td>0.320</td>
<td>0.350</td>
</tr>
<tr>
<td>Window 5: Vinyl/Fiberglass Frame: Operable, Perf. Specs.: Product ID WWD-A-15-00016-00001, SHGC 0.30, PF 0.17, VT 0.57, [Bldg. Use 1 - Transportation] (b)</td>
<td>16</td>
<td>---</td>
<td>---</td>
<td>0.320</td>
<td>0.350</td>
</tr>
<tr>
<td>Window 6: Vinyl/Fiberglass Frame: Operable, Perf. Specs.: Product ID WWD-A-15-00016-00001, SHGC 0.30, PF 0.17, VT 0.57, [Bldg. Use 1 - Transportation] (b)</td>
<td>16</td>
<td>---</td>
<td>---</td>
<td>0.320</td>
<td>0.350</td>
</tr>
<tr>
<td>Door #10: Insulated Metal, Swinging, [Bldg. Use 1 - Transportation]</td>
<td>21</td>
<td>---</td>
<td>---</td>
<td>0.130</td>
<td>0.700</td>
</tr>
<tr>
<td>Exterior Wall 2: Metal Building Wall, Unspecified, [Bldg. Use 1 - Transportation]</td>
<td>1092</td>
<td>25.0</td>
<td>0.0</td>
<td>0.058</td>
<td>0.069</td>
</tr>
<tr>
<td><strong>SOUTH</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exterior Wall 4: Solid Concrete: 6&quot; Thickness, Normal Density, Furring: Wood, [Bldg. Use 1 - Transportation]</td>
<td>180</td>
<td>25.0</td>
<td>0.0</td>
<td>0.051</td>
<td>0.090</td>
</tr>
<tr>
<td>Exterior Wall 4 with 2x4 Furring to 8' A.F.F.: Metal Building Wall, Unspecified, [Bldg. Use 1 - Transportation]</td>
<td>324</td>
<td>40.0</td>
<td>0.0</td>
<td>0.048</td>
<td>0.069</td>
</tr>
<tr>
<td>Door #13: Insulated Metal, Swinging, [Bldg. Use 1 - Transportation]</td>
<td>21</td>
<td>---</td>
<td>---</td>
<td>0.130</td>
<td>0.700</td>
</tr>
<tr>
<td>Door #14: Insulated Metal, Swinging, [Bldg. Use 1 - Transportation]</td>
<td>21</td>
<td>---</td>
<td>---</td>
<td>0.130</td>
<td>0.700</td>
</tr>
<tr>
<td>Exterior Wall 4: Metal Building Wall, Unspecified, [Bldg. Use 1 - Transportation]</td>
<td>740</td>
<td>25.0</td>
<td>0.0</td>
<td>0.058</td>
<td>0.069</td>
</tr>
<tr>
<td><strong>WEST</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exterior Wall 1: Solid Concrete: 6&quot; Thickness, Normal Density, Furring: Wood, [Bldg. Use 1 - Transportation]</td>
<td>234</td>
<td>25.0</td>
<td>0.0</td>
<td>0.051</td>
<td>0.090</td>
</tr>
<tr>
<td>Exterior Wall 1 with 2x4 Furring to 8' A.F.F.: Metal Building Wall, Unspecified, [Bldg. Use 1 - Transportation]</td>
<td>713</td>
<td>40.0</td>
<td>0.0</td>
<td>0.048</td>
<td>0.069</td>
</tr>
<tr>
<td>Window 1: Vinyl/Fiberglass Frame: Operable, Perf. Specs.: Product ID WWD-A-15-00016-00001, SHGC 0.30, PF 0.17, VT 0.57, [Bldg. Use 1 - Transportation] (b)</td>
<td>16</td>
<td>---</td>
<td>---</td>
<td>0.320</td>
<td>0.350</td>
</tr>
<tr>
<td>Exterior Wall 1: Metal Building Wall, Unspecified, [Bldg. Use 1 - Transportation]</td>
<td>1092</td>
<td>25.0</td>
<td>0.0</td>
<td>0.058</td>
<td>0.069</td>
</tr>
<tr>
<td>Door #1: Insulated Metal, Swinging, [Bldg. Use 1 - Transportation]</td>
<td>21</td>
<td>---</td>
<td>---</td>
<td>0.130</td>
<td>0.700</td>
</tr>
<tr>
<td>Door #15: Insulated Metal, Non-Swinging, [Bldg. Use 1 - Transportation]</td>
<td>120</td>
<td>---</td>
<td>---</td>
<td>0.130</td>
<td>0.500</td>
</tr>
<tr>
<td>Door #16: Insulated Metal, Non-Swinging, [Bldg. Use 1 - Transportation]</td>
<td>120</td>
<td>---</td>
<td>---</td>
<td>0.130</td>
<td>0.500</td>
</tr>
<tr>
<td>Door #17: Insulated Metal, Non-Swinging, [Bldg. Use 1 - Transportation]</td>
<td>120</td>
<td>---</td>
<td>---</td>
<td>0.130</td>
<td>0.500</td>
</tr>
<tr>
<td>Door #18: Insulated Metal, Non-Swinging, [Bldg. Use 1 - Transportation]</td>
<td>120</td>
<td>---</td>
<td>---</td>
<td>0.130</td>
<td>0.500</td>
</tr>
</tbody>
</table>

(a) Budget U-factors are used for software baseline calculations ONLY, and are not code requirements.  
(b) Fenestration product performance must be certified in accordance with NFRC and requires supporting documentation.  
(c) Slab-On-Grade proposed and budget U-factors shown in table are F-factors.  
(d) Thermal spacer block with minimum R-3.5 must be installed above the purlin/batt, and the roof deck secured to the purlins.

**Envelope PASSES: Design 12% better than code**

**Envelope Compliance Statement**

*Compliance Statement:* The proposed envelope design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed envelope systems have been designed to meet the 90.1 (2010) Standard requirements in COMcheck Version 4.0.5.4 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.
Requirements: 95.0% were addressed directly in the COMcheck software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

<table>
<thead>
<tr>
<th>Section # &amp; Req.ID</th>
<th>Plan Review</th>
<th>Complies?</th>
<th>Comments/Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.2.2.5.4, 3.1.1.5.7 [PR1]</td>
<td>Plans and/or specifications provide all information with which compliance can be determined for the building envelope and document where exceptions to the standard are claimed.</td>
<td>Complies</td>
<td>Requirement will be met.</td>
</tr>
<tr>
<td>4.2.2.8.4, 1.1.8.4.1.2.8.7 [PR6]</td>
<td>Plans, specifications, and/or calculations provide all information with which compliance can be determined for the electrical systems and equipment and document where exceptions are claimed. Feeder connectors sized in accordance with approved plans and branch circuits sized for maximum drop of 3%.</td>
<td>Complies</td>
<td>Requirement will be met.</td>
</tr>
</tbody>
</table>

Additional Comments/Assumptions:

1 High Impact (Tier 1)  2 Medium Impact (Tier 2)  3 Low Impact (Tier 3)
<table>
<thead>
<tr>
<th>Section # &amp; Req.ID</th>
<th>Footing / Foundation Inspection</th>
<th>Plans Verified Value</th>
<th>Field Verified Value</th>
<th>Complies?</th>
<th>Comments/Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.5.3.3 [FO1]²</td>
<td>Below-grade wall insulation R-value.</td>
<td>R-_____</td>
<td>R-_____</td>
<td>☐ Complies</td>
<td>☐ Does Not&lt;br&gt;☐ Not Observable&lt;br&gt;☐ Not Applicable</td>
</tr>
<tr>
<td>5.5.3.5 [FO3]²</td>
<td>Slab edge insulation R-value.</td>
<td>R-_____</td>
<td>R-_____</td>
<td>☐ Complies&lt;br&gt;☐ Does Not&lt;br&gt;☐ Not Observable&lt;br&gt;☐ Not Applicable</td>
<td>See the Envelope Assemblies table for values.</td>
</tr>
<tr>
<td>5.8.1.2 [FO4]²</td>
<td>Slab edge insulation installed per manufacturer’s instructions.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.5.3.5 [FO5]²</td>
<td>Slab edge insulation depth/length.</td>
<td>____ ft</td>
<td>____ ft</td>
<td>☐ Complies&lt;br&gt;☐ Does Not&lt;br&gt;☐ Not Observable&lt;br&gt;☐ Not Applicable</td>
<td>See the Envelope Assemblies table for values.</td>
</tr>
<tr>
<td>5.8.1.7.3 [FO7]²</td>
<td>Insulation in contact with the ground has &lt;=0.3% water absorption rate per ASTM C272.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.4.4.1.5 [FO11]³</td>
<td>Bottom surface of floor structures incorporating radiant heating insulated to &gt;=R-3.5.</td>
<td>R-_____</td>
<td>R-_____</td>
<td>☐ Complies&lt;br&gt;☐ Does Not&lt;br&gt;☐ Not Observable&lt;br&gt;☐ Not Applicable</td>
<td>Exception: Requirement does not apply. See the Envelope Assemblies table for values.</td>
</tr>
</tbody>
</table>

Additional Comments/Assumptions:

<table>
<thead>
<tr>
<th>Impact Level</th>
<th>Tier</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>High Impact (Tier 1)</td>
</tr>
<tr>
<td>2</td>
<td>Medium Impact (Tier 2)</td>
</tr>
<tr>
<td>3</td>
<td>Low Impact (Tier 3)</td>
</tr>
</tbody>
</table>

---

Project Title: New Athol ITD Maintenance Building

Data filename: P:\Projects\2016\16118 ITD New Maint. Bldg - Athol\Com Check\16118-COMcheck 90.1 2010.cc

Report date: 09/20/17

Page 5 of 11
<table>
<thead>
<tr>
<th>Section # &amp; Req.ID</th>
<th>Framing / Rough-In Inspection</th>
<th>Plans Verified Value</th>
<th>Field Verified Value</th>
<th>Complies?</th>
<th>Comments/Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.4.3.2 [FR1]²</td>
<td>Factory-built fenestration and doors are labeled as meeting air leakage requirements.</td>
<td></td>
<td></td>
<td></td>
<td>Requirement will be met.</td>
</tr>
<tr>
<td>5.4.3.4 [FR4]²</td>
<td>Vestibules are installed where building entrances separate conditioned space from the exterior, and meet exterior envelope requirements. Doors have self-closing devices, and are &gt;=7 ft apart.</td>
<td></td>
<td></td>
<td></td>
<td>Exception: Requirement does not apply.</td>
</tr>
<tr>
<td>5.5.4.3a [FR8]²</td>
<td>Vertical fenestration U-Factor.</td>
<td>U-____</td>
<td>U-____</td>
<td></td>
<td>See the Envelope Assemblies table for values.</td>
</tr>
<tr>
<td>5.5.4.3b [FR9]²</td>
<td>Skylight fenestration U-Factor.</td>
<td>U-____</td>
<td>U-____</td>
<td></td>
<td>See the Envelope Assemblies table for values.</td>
</tr>
<tr>
<td>5.5.4.4.1 [FR10]¹</td>
<td>Vertical fenestration SHGC value.</td>
<td>SHGC:_____</td>
<td>SHGC:_____</td>
<td></td>
<td>See the Envelope Assemblies table for values.</td>
</tr>
<tr>
<td>5.5.4.4.2 [FR11]¹</td>
<td>Skylight SHGC value.</td>
<td>SHGC:_____</td>
<td>SHGC:_____</td>
<td></td>
<td>See the Envelope Assemblies table for values.</td>
</tr>
<tr>
<td>5.8.2.1 [FR12]²</td>
<td>Fenestration products rated in accordance with NFRC.</td>
<td></td>
<td></td>
<td></td>
<td>Requirement will be met.</td>
</tr>
<tr>
<td>5.8.2.2 [FR13]¹</td>
<td>Fenestration products are certified as to performance labels or certificates provided.</td>
<td></td>
<td></td>
<td></td>
<td>Requirement will be met.</td>
</tr>
<tr>
<td>5.8.2.3, 5.3.6 [FR14]²</td>
<td>U-factor of opaque doors associated with the building thermal envelope meets requirements.</td>
<td>U-____</td>
<td>Swinging</td>
<td>U-____</td>
<td>Swinging</td>
</tr>
<tr>
<td>5.4.3.1 [FR15]¹</td>
<td>Continuous air barrier is wrapped, sealed, caulked, gasketed, and/or taped in an approved manner, except in semiheated spaces and in climate zones 1-6.</td>
<td></td>
<td></td>
<td></td>
<td>Requirement will be met.</td>
</tr>
</tbody>
</table>

**Additional Comments/Assumptions:**

1 High Impact (Tier 1)  2 Medium Impact (Tier 2)  3 Low Impact (Tier 3)
<table>
<thead>
<tr>
<th>Section # &amp; Req.ID</th>
<th>Rough-In Electrical Inspection</th>
<th>Complies?</th>
<th>Comments/Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.4.2 [EL10]²</td>
<td>At least 50% of all 125 volt 15- and 20-Amp receptacles are controlled by an automatic control device.</td>
<td>☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable</td>
<td><strong>Exception:</strong> Requirement does not apply.</td>
</tr>
</tbody>
</table>

**Additional Comments/Assumptions:**
<table>
<thead>
<tr>
<th>Section # &amp; Req.ID</th>
<th>Insulation Inspection</th>
<th>Plans Verified Value</th>
<th>Field Verified Value</th>
<th>Complies?</th>
<th>Comments/Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.4.3.1 [IN1]²</td>
<td>All sources of air leakage in the building thermal envelope are sealed, caulked, gasketed, weather stripped or wrapped with moisture vapor-permeable wrapping material to minimize air leakage.</td>
<td></td>
<td></td>
<td></td>
<td>Requirement will be met.</td>
</tr>
<tr>
<td>5.5.3.1 [IN2]²</td>
<td>Roof R-value. For some ceiling systems, verification may need to occur during Framing Inspection.</td>
<td>R-</td>
<td></td>
<td></td>
<td>See the Envelope Assemblies table for values.</td>
</tr>
<tr>
<td>5.8.1.2, 8.1.3 [IN3]³</td>
<td>Roof insulation installed per manufacturer's instructions. Blown or poured loose-fill insulation is installed only where the roof slope is &lt;=3 in 12.</td>
<td>R-</td>
<td></td>
<td></td>
<td>Requirement will be met.</td>
</tr>
<tr>
<td>5.5.3.2 [IN6]²</td>
<td>Above-grade wall insulation R-value.</td>
<td>R-</td>
<td></td>
<td></td>
<td>See the Envelope Assemblies table for values.</td>
</tr>
<tr>
<td>5.8.1.2 [IN7]²</td>
<td>Above-grade wall insulation installed per manufacturer's instructions.</td>
<td></td>
<td></td>
<td></td>
<td>Requirement will be met.</td>
</tr>
<tr>
<td>5.5.3.4 [IN8]²</td>
<td>Floor insulation R-value.</td>
<td>R-</td>
<td></td>
<td></td>
<td>See the Envelope Assemblies table for values.</td>
</tr>
<tr>
<td>5.8.1.1 [IN10]²</td>
<td>Building envelope insulation is labeled with R-value or insulation certificate providing R-value and other relevant data.</td>
<td></td>
<td></td>
<td></td>
<td>Requirement will be met.</td>
</tr>
<tr>
<td>5.8.1.4 [IN11]²</td>
<td>Eaves are baffled to deflect air to above the insulation.</td>
<td></td>
<td></td>
<td></td>
<td>Requirement will be met.</td>
</tr>
<tr>
<td>5.8.1.5 [IN12]²</td>
<td>Insulation is installed in substantial contact with the inside surface separating conditioned space from unconditioned space.</td>
<td></td>
<td></td>
<td></td>
<td>Requirement will be met.</td>
</tr>
<tr>
<td>5.8.1.6 [IN13]²</td>
<td>Recessed equipment installed in building envelope assemblies does not compress the adjacent insulation.</td>
<td></td>
<td></td>
<td></td>
<td>Requirement will be met.</td>
</tr>
</tbody>
</table>

---

Project Title: New Athol ITD Maintenance Building

Report date: 09/20/17

Data filename: P:\Projects\2016\16118 ITD New Maint. Bldg - Athol\Com Check\16118-COMcheck 90.1 2010.cck 09/20/17 Report date: 11 8 of 11
<table>
<thead>
<tr>
<th>Section # &amp; Req.ID</th>
<th>Insulation Inspection</th>
<th>Plans Verified Value</th>
<th>Field Verified Value</th>
<th>Complies?</th>
<th>Comments/Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.8.1.7 [IN14]</td>
<td>Exterior insulation is protected from damage with a protective material. Verification for exposed foundation insulation may need to occur during Foundation Inspection.</td>
<td></td>
<td></td>
<td>☑ Complies</td>
<td>Requirement will be met.</td>
</tr>
<tr>
<td>5.8.1.7.1 [IN15]</td>
<td>Attics and mechanical rooms have insulation protected where adjacent to attic or equipment access.</td>
<td></td>
<td></td>
<td>☑ Complies</td>
<td>Requirement will be met.</td>
</tr>
<tr>
<td>5.8.1.7.2 [IN16]</td>
<td>Foundation vents do not interfere with insulation.</td>
<td></td>
<td></td>
<td>☑ Complies</td>
<td>Requirement will be met.</td>
</tr>
<tr>
<td>5.8.1.8 [IN17]</td>
<td>Insulation intended to meet the roof insulation requirements cannot be installed on top of a suspended ceiling. Mark this requirement compliant if insulation is installed accordingly.</td>
<td></td>
<td></td>
<td>☑ Complies</td>
<td>Requirement will be met.</td>
</tr>
</tbody>
</table>

**Additional Comments/Assumptions:**
<table>
<thead>
<tr>
<th>Section # &amp; Req.ID</th>
<th>Final Inspection</th>
<th>Complies?</th>
<th>Comments/Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.4.3.3 [F1]²</td>
<td>Weatherseals installed on all loading dock cargo doors in Climate Zones 4-8.</td>
<td>☐ Complies ☐ Does Not ☐ Not Observable ☐ Not Applicable</td>
<td>Exception: Requirement does not apply.</td>
</tr>
</tbody>
</table>

**Additional Comments/Assumptions:**
SECTION 01100 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. See 1.3, Page 1, General Information of ITD requirements.
2. Project information.
4. Work by Owner.
5. Owner-furnished products.
6. Access to site.
7. Work restrictions.
8. Specification and drawing conventions.

B. Related Requirements:

1. Section 01500 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: New Maintenance Building, Project __________

1. Project Location: Athol, Idaho.

B. Owner: Idaho Transportation Department, P.O. Box 7129, Boise, Idaho, 83707.

1. Owner's Representative: Mike Lenz

C. Architect: Don Hutchison, Hutchison Smith Architects.

D. Consultants: ITD has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Mechanical Engineer: Nielson Engineering, Pocatello, Idaho

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. The purpose of this ITB is to solicit sealed bids to establish a contract between ITD and a Contractor for the structural design and construction of a rigid frame metal building including structural design of foundation, 2nd floor framing, supporting walls, headers, beams, etc., along with mechanical, electrical and site improvements at St. Anthony, Idaho.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 WORK BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

B. Preceding Work: Owner will perform the following construction operations at Project site. Those operations are scheduled to be substantially complete before work under this Contract begins.

1. Excavation, remove the soil, add and compact the structural fill and bring the compacted base to within 11” of finished floor. (G.C. is responsible for 5” concrete slab & 6” compacted ¾” minus base) ITD will establish finish floor elevation.

1.6 ACCESS TO SITE

A. Use of Site: Limit use of Project site to areas within the limits set by ITD. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

a. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.7 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to normal business working hours of 7:00 a.m. to 4:00 p.m., Monday through Friday, unless otherwise indicated.
1. Weekend Hours: With written permission of ITD
2. Early Morning Hours: With written permission of ITD.
3. Hours for Utility Shutdowns: With written permission of ITD.
4. Noise: Equipment must have original exhaust mufflers or equivalent.

C. Existing Utility Interruptions: Do not interrupt utilities serving adjacent facilities unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, Dust and Odors: Coordinate operations that may result in high levels of noise, dust, vibration, odors, or other disruption with Owner and Authority having jurisdiction. Maintain low dust using low pressure water spray to maintain clean air.

E. Nonsmoking: Smoking is not permitted on the entire site.

F. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

G. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

H. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Owner's representative.

I. Trash: Contractor shall maintain onsite dumpster and arrange for pickup to maintain a clean site.

J. Burning: Onsite burning is prohibited.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01100
SECTION 01250 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary
   Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY
A. This Section specifies administrative and procedural requirements for handling and processing
   Contract modifications.
B. Related Sections include the following:
   1. Division 1 Section "Product Requirements" for administrative procedures for handling
      requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK
A. Design Professional will issue supplemental instructions authorizing Minor Changes in the
   Work, not involving adjustment to the Contract Sum or the Contract Time, on
   AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS
A. Owner-Initiated Proposal Requests: Design Professional will issue a detailed description of
   proposed changes in the Work that may require adjustment to the Contract Sum or the Contract
   Time. If necessary, the description will include supplemental or revised Drawings and
   Specifications.

   1. Proposal Requests issued by Design Professional are for information only. Do not
      consider them instructions either to stop work in progress or to execute the proposed
      change.

   2. Within time specified in Proposal Request after receipt of Proposal Request, submit a
      quotation estimating cost adjustments to the Contract Sum and the Contract Time
      necessary to execute the change.

      a. Include a list of quantities of products required or eliminated and unit costs, with
         total amount of purchases and credits to be made. If requested, furnish survey data
         to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade
         discounts.
      c. Include costs of labor and supervision directly attributable to the change.
      d. Include an updated Contractor's Construction Schedule that indicates the effect of
         the change, including, but not limited to, changes in activity duration, start and
finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Design Professional.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal, Design Professional will issue a Change Order for signatures of Owner and Contractor on Change Order Form provided by Architect.

1.6 CONSTRUCTION CHANGE DIRECTIVE


1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

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

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION 01250
SECTION 01290 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections include the following:
   1. Division 1 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   2. Division 1 Section “Project Closeout” for additional requirements related to Final Payment application.

1.3 DEFINITIONS

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

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

   1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
      a. Application for Payment forms with Continuation Sheets.
      b. Submittals Schedule.
      c. Contractor's Construction Schedule showing Phased Construction.

   2. Submit the Schedule of Values to Design Professional at Pre-Construction Meeting.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
1. Identification: Include the following Project identification on the Schedule of Values:
   a. Project name and location.
   b. Project Number.
   c. Name of Design Professional.
   d. Design Professional's project number.
   e. Contractor's name and address.
   f. Date of submittal.

2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
   a. Related Specification Section or Division.
   b. Description of the Work.
   c. Change Orders (numbers) that affect value.
   d. Dollar value.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
   a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.

6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
   a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

8. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

9. Project Closeout – Provide a separate line item for performing project closeout procedures.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Design Professional and paid for by Owner.
1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: Progress payments shall be submitted to Design Professional by the fifth day of the month. The period covered by each Application for Payment is one month, ending on the last day of the month or as otherwise agreed to.

C. Payment Application Forms: Use AIA G702 and G703 Applications for Payment or pre-approved application by the Architect that has similar format.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Design Professional will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Transmittal: Submit (1) One signed and notarized original copy of each Application for Payment to Design Professional by a method ensuring receipt.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
2. All signatures shall be in blue ink.

F. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Submittals Schedule (preliminary if not final).
5. List of Contractor's staff assignments.

G. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete (Phased). Provide documents per Section 01770 – Project Closeout.

H. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted per Specification Section 01770 – Project Closeout and Specification Section 01781 – Project Record Documents.

1. As-Built Drawings
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01290
SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General project coordination procedures.
2. Administrative and supervisory personnel.
3. Requests for Information (RFIs).
4. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Sections:
1. Division 1 Section "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Division 1 Section "Execution Requirements" for procedures for coordinating general installation.
3. Division 1 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Owner, Design Professional, or Contractor seeking information from each other during construction.

1.4 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Startup and adjustment of systems.
8. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 KEY PERSONNEL

A. Key Personnel Names: At Pre-Construction Meeting, 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, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in designated location. Keep list current at all times.

1.6 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Design Professional will return RFIs submitted to Design Professional by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project No.
2. Project name and location
3. Date.
4. Name of Contractor.
5. Name of Design Professional.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

   a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Standard Request for Information Form.

D. Design Professional's Action: Design Professional will review each RFI, determine action required, and respond. Allow seven working days for Design Professional's response for each RFI. RFIs received by Design Professional after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

   a. Requests for approval of submittals.
   b. Requests for approval of substitutions.
   c. Requests for coordination information already indicated in the Contract Documents.
   d. Requests for adjustments in the Contract Time or the Contract Sum.
   e. Requests for interpretation of Design Professional's actions on submittals.
   f. Incomplete RFIs or inaccurately prepared RFIs.

2. Design Professional's action may include a request for additional information, in which case Design Professional's time for response will date from time of receipt of additional information.

3. Design Professional's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 1 Section "Contract Modification Procedures."

   a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Design Professional in writing within seven days of receipt of the RFI response.

E. On receipt of Design Professional's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Design Professional within seven days if Contractor disagrees with response.

F. RFI Log: Prepare, maintain, and submit a tabular log in digital format of RFIs organized by the RFI number. Log shall contain the following:
1. Project No.
2. Project name and location.
3. Name and address of Contractor.
4. Name and address of Design Professional.
5. RFI number including RFIs that were dropped and not submitted.
6. RFI description.
7. Date the RFI was submitted.
8. Date Design Professional's response was received.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Design Professional of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Design Professional, within three days of the meeting.

B. Preconstruction Conference: The Architect will schedule a preconstruction conference before starting construction, at a time convenient to the Owner and the Contractor. The meeting will review responsibilities and personnel assignments. The Design Professional will chair the meeting and the Design Professional will distribute minutes within three (3) days after the meeting.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of Owner, Design Professional, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:
   a. Tentative construction schedule.
   b. Phasing.
   c. Critical work sequencing and long-lead items.
   d. Designation of key personnel and their duties.
   e. Lines of communications.
   f. Procedures for processing field decisions and Change Orders.
   g. Procedures for RFIs.
   h. Procedures for testing and inspecting.
   i. Procedures for processing Applications for Payment.
   j. Distribution of the Contract Documents.
   k. Submittal procedures.
   l. Preparation of record documents.
m. Use of the premises and existing building.

n. Work restrictions.

o. Working hours.

p. Owner's occupancy requirements.

q. Responsibility for temporary facilities and controls.

r. Procedures for disruptions and shutdowns.

s. Construction waste management and recycling.

t. Parking availability.

u. Office, work, and storage areas.

v. Equipment deliveries and priorities.

w. First aid.

x. Security.

y. Progress cleaning.

C. Preinstallation Conferences: Conduct 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 Design Professional and Owner 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:

   b. Options.
   c. Related RFIs.
   d. Related Change Orders.
   e. Purchases.
   f. Deliveries.
   g. Submittals.
   h. Review of mockups.
   i. Possible conflicts.
   j. Compatibility problems.
   k. Time schedules.
   l. Weather limitations.
   m. Manufacturer's written recommendations.
   n. Warranty requirements.
   o. Compatibility of materials.
   p. Acceptability of substrates.
   q. Temporary facilities and controls.
   r. Space and access limitations.
   s. Regulations of authorities having jurisdiction.
   t. Testing and inspecting requirements.
   u. Installation procedures.
   v. Coordination with other work.
   w. Required performance results.
   x. Protection of adjacent work.
   y. 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 and to other parties requiring information.

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.

D. Progress Meetings: Conduct progress meetings at monthly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner and Design Professional, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.
12) Field observations.
13) Status of RFI's.
14) Status of proposal requests.
15) Pending changes.
16) Status of Change Orders.
17) Pending claims and disputes.
18) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01310
SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Contractor's construction schedule.
   2. Construction schedule updating reports.
   3. Daily construction reports.
   4. Site condition reports.
   5. Special reports.

B. Related Requirements:
   1. Section 01330 "Submittal Procedures" for submitting schedules and reports.
   2. Section 01400 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

   1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
   2. Predecessor Activity: An activity that precedes another activity in the network.
   3. Successor Activity: An activity that follows another activity in the network.

B. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

C. Event: The starting or ending point of an activity.

D. Float: The measure of leeway in starting and completing an activity.

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

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. One paper copy.

B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a pdf of schedule and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

C. Construction Schedule Updating Reports: Submit with Applications for Payment.

D. Daily Construction Reports: Submit at weekly intervals.

1.5 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 30 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

4. Startup and Testing Time: Include no fewer than 5 days for startup and testing.

5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Design Professional's administrative procedures necessary for certification of Substantial Completion.

6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.

2. Work Restrictions: Show the effect of the following items on the schedule:
   a. Coordination with existing construction.
   b. Limitations of continued occupancies.
   c. Uninterruptible services.
   d. Use of premises restrictions.

3. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
   a. Submittals.
   b. Fabrication.
   c. Deliveries.
   d. Installation.
   e. Tests and inspections.
   f. Adjusting.
   g. Startup and placement into final use and operation.

4. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion and the following interim milestones:

1. Start of on-site work in each building.

2. Substantial Completion of each building.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART OR BAR CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 10 days of date established for the Notice to Proceed or at the Contractors’ option provide a Bar Chart type Construction Schedule

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
2.3 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events.
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.

B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.4 SPECIAL REPORTS

A. General: Submit special reports to Owner and Design Professional within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At two week intervals, update schedule to reflect actual construction progress and activities. Issue schedule two days before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have
   been recognized or made. Issue updated schedule concurrently with the report of each
   such meeting.
2. Include a report with updated schedule that indicates every change, including, but not
   limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Design Professional, Owner, separate
   contractors, testing and inspecting agencies, and other parties identified by Contractor with a
   need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the
   same locations. Delete parties from distribution when they have completed their assigned
   portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01320
SECTION 01330 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY
A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
B. Related Sections include the following:
   1. Division 1 Section "Product Requirements" for submittal of substitution request.
   2. Division 1 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
   3. Division 1 Section "Project Closeout" for submitting warranties.
   4. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
   5. Division 1 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
   6. Divisions 2 through 16 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS
A. Action Submittals: Written and graphic information that requires Design Professional's responsive action.
B. Informational Submittals: Written information that does not require Design Professional's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES
A. General: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Design Professional for Contractor's use in preparing submittals.
   1. Contractor will be required to sign Design Professional’s release form prior to Design Professional’s release of Electronic Drawing files.
B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

   a. Design Professional reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Design Professional’s receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

   1. Initial Review: Allow 10 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Design Professional will advise Contractor when a submittal being processed must be delayed for coordination.
   2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
   3. Resubmittal Review: Allow 5 working days for review of each resubmittal.

D. Identification: Place a permanent label or title block on each submittal for identification.

   1. Indicate name of firm or entity that prepared each submittal on label or title block.
   2. Provide a space approximately 4 x 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Design Professional.
   3. Include the following information on label for processing and recording action taken:
      
      a. Project name and Project number.
      b. Date.
      c. Name and address of Design Professional.
      d. Name and address of Contractor.
      e. Name and address of subcontractor.
      f. Name and address of supplier.
      g. Name of manufacturer.
      h. Number and title of appropriate Specification Section.
      i. Drawing number and detail references, as appropriate.
      j. Location(s) where product is to be installed, as appropriate.
      k. Other necessary identification.

E. Deviations: Highlight, cloud, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

F. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Design Professional will return submittals, without review, discard submittals received from sources other than Contractor.

   1. Transmittal Form: Contractor’s standard transmittal form. Provide locations on form for the following information:
      
      a. Project name and project number.
      b. Date.
      c. Destination (To:).
d. Source (From:).
e. Names of subcontractor, manufacturer, and supplier.
f. Category and type of submittal.
g. Submittal purpose and description.
h. Specification Section number and title.
i. Drawing number and detail references, as appropriate.
j. Transmittal number, numbered consecutively.
k. Remarks.
l. Signature of transmitter.

2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Design Professional on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.

G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
   1. Note date and content of previous submittal.
   2. Note date and content of revision in label or title block and clearly indicate extent of revision.
   3. Resubmit submittals until they are marked "Reviewed" or “Furnish as Corrected”.

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

I. Use for Construction: Use only final submittals with mark indicating "Reviewed” or “Furnish as Corrected" taken by Design Professional.

1.5 CONTRACTOR'S USE OF DESIGN PROFESSIONAL’S CAD FILES

A. General: At Contractor's written request, copies of Design Professional's CAD files may be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:
   1. CAD files may only be used for purposes related to the specific project for which they were requested.
   2. All designs, images and representations are to remain solely the copyright of the Design Professional.
   3. The Design Professional does not warrant the accuracy of any CAD files and assumes no responsibility for errors, omissions or discrepancies contained therein.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.
B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
   a. Manufacturer's written recommendations.
   b. Manufacturer's product specifications.
   c. Manufacturer's installation instructions.
   d. Standard color charts.
   e. Manufacturer's catalog cuts.
   f. Wiring diagrams showing factory-installed wiring.
   g. Printed performance curves.
   h. Operational range diagrams.
   i.
   j. Standard product operation and maintenance manuals.
   k. Compliance with specified referenced standards.
   l. Testing by recognized testing agency.
   m. Application of testing agency labels and seals.
   n. Notation of coordination requirements.

4. Submit Product Data before or concurrent with Samples.
5. Number of Copies: Submit six (6) copies of Product Data, unless otherwise indicated. Design Professional, will return two copies. Mark up and retain one returned copy as a Project Record Document.

C. Shop Drawings: Prepare Project-specific information, verified on site and drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Dimensions.
   b. Identification of products.
   c. Fabrication and installation drawings.
   d. Roughing-in and setting diagrams.
   e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
   f. Shopwork manufacturing instructions.
   g. Templates and patterns.
   h. Schedules.
   i. Design calculations.
   j. Compliance with specified standards.
   k. Notation of coordination requirements.
   l. Notation of dimensions established by field measurement.
   m. Relationship to adjoining construction clearly indicated.
   n. Seal and signature of professional engineer if specified.
o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 24 by 36 inches.

3. Number of Copies: Submit six (6) opaque (bond) copies of each submittal. Design Professional will return two copies.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

2. Identification: Attach label on unexposed side of Samples that includes the following:

   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of appropriate Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

   a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Design Professional will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

   a. Number of Samples: Submit three sets of Samples. Design Professional will retain two Sample sets; remainder will be returned.
1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit sets of units that show approximate limits of variations.

E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product.
2. Number and name of room or space.
3. Location within room or space.
4. Number of Copies: Submit six copies of product schedule or list, unless otherwise indicated. Design Professional, will return two copies.

F. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation" for Construction Manager's action.

G. Submittals Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."

H. Application for Payment: Comply with requirements specified in Division 1 Section "Payment Procedures."

I. Schedule of Values: Comply with requirements specified in Division 1 Section "Payment Procedures."

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit six (6) copies of each submittal, unless otherwise indicated. Design Professional will not return copies.
2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

B. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."

C. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.
8. Design Professional will review submittals that include MSDSs.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Design Professional.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 DESIGN PROFESSIONAL'S ACTION

A. General: Design Professional will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Design Professional will review each submittal, make marks to indicate corrections or modifications required, and return it. Design Professional will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
   1. Reviewed.
   2. Furnish as Corrected.
   3. Revise and resubmit.
   4. Rejected.

C. Informational Submittals: Design Professional will review each submittal and will not return it, or will return it if it does not comply with requirements. Design Professional will forward each submittal to appropriate party.

D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 01330
SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.

C. Water Service: Pay water-service use charges for water used by all entities for construction operations.

D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.4 INFORMATIONAL SUBMITTALS

A. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

B. Dust and HVAC-Control Plan: Submit narrative that indicates the dust control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate.

Fuel Spill: Contractor shall comply with all regulations to handle any fuel spills, containment shall be available on site at all times.
1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.


1.6 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.2 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.
3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.
   1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
   1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
   1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
   1. Install electric power service underground unless otherwise indicated.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.
   1. At each telephone, post a list of important telephone numbers.
      a. Police and fire departments.
      b. Ambulance service.
c. Contractor's home office.
d. Contractor's emergency after-hours telephone number.
e. Architect's office.
f. Engineers' offices.
g. Owner's office.
h. Principal subcontractors' field and home offices.

2. Provide superintendent with cellular telephone.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
   1. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads: Construct and maintain temporary roads adequate for construction operations.

C. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
   1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
   2. Remove snow and ice as required to minimize accumulations.

E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.

F. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
   1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of the current EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
   1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

C. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

E. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

G. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

H. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating is needed and permanent enclosure is incomplete, insulate temporary enclosures.

I. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary fire extinguishers for fire protection.

3.5 MOISTURE AND MOLD CONTROL

A. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

B. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace, or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01770 "Closeout Procedures."

END OF SECTION 01500
SECTION 01635 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Sections:
   1. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
   2. Divisions 2 through 16 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
   1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
   2. Substitutions for Convenience: Changes proposed by Contractor that are not required in order to meet other Project requirements but may offer advantage to Contractor.

1.4 SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Substitution Request Form: Use CSI Form 13.1A.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
      a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
      b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of Design Professionals and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Design Professional's Action: If necessary, Design Professional will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Design Professional will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Design Professional's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Design Professional does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.
1.6 PROCEDURES

A. Coordination: Modify or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Design Professional will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Design Professional will return requests without action, except to record noncompliance with these requirements:

   a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
   b. Substitution request is fully documented and properly submitted.
   c. Requested substitution will not adversely affect Contractor's construction schedule.
   d. Requested substitution has received necessary approvals of authorities having jurisdiction.
   e. Requested substitution is compatible with other portions of the Work.
   f. Requested substitution has been coordinated with other portions of the Work.
   g. Requested substitution provides specified warranty.
   h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed after 10 days prior to bid opening.

C. Substitutions for Convenience: Design Professional will consider requests for substitution if received before 10 days prior to bid opening. Requests received after that time may be considered or rejected at discretion of Design Professional.

1. Conditions: Design Professional will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Design Professional will return requests without action, except to record noncompliance with these requirements:

   a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Design Professional for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
   b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.

d. Substitution request is fully documented and properly submitted.

e. Requested substitution will not adversely affect Contractor's construction schedule.

f. Requested substitution has received necessary approvals of authorities having jurisdiction.

g. Requested substitution is compatible with other portions of the Work.

h. Requested substitution has been coordinated with other portions of the Work.

i. Requested substitution provides specified warranty.

j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01635
SECTION 01770 - PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:

1. Inspection procedures.
2. Reinspection.
3. Final Acceptance.
4. Closeout Procedures

B. Related Sections include the following:

1. Division 1, Section "PROJECT RECORD DOCUMENTS" for project record document requirements.
3. Division 1, Section “OPERATION AND MAINTENANCE DATA" for operating and maintenance manual requirements.
4. Division 1, Section “PRODUCT REQUIREMENTS” for warranty requirements.

C. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions-2 through -16.

1.3 SUBSTANTIAL COMPLETION

A. Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. (List exceptions in the request).

1. Advise Owner/Agency of pending change-over requirements.
2. Obtain and submit releases enabling the Owner/Agency unrestricted use of the Work and access to services and utilities.
3. Submit record drawings, maintenance and operational manuals, and similar final record information.
   a. Submittal of record drawings, O & M Manuals, etc., must occur a minimum of 15 days prior to a written request for Substantial Completion inspection.
4. Deliver tools, spare parts, extra stock, and similar items, if any required in Divisions 2 through 16.
5. Complete start-up testing of systems, and instruction of the Owner/Agency's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
6. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

7. All systems, including emergency systems, shall have been completely tested in the presence of the appropriate Project Engineer. Submit a form signed by the appropriate engineer stating this has been done in their presence and all systems are working as designed and satisfactorily.

B. Substantial Completion Inspection Procedures: On receipt by the Design Professional of a written request from the Contractor for substantial completion inspection (punch list items), the Design Professional will either proceed with inspection or advise the Contractor of unfilled requirements (paragraph A under 1.3 above). The Design Professional will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The certificate of substantial completion will be issued when the project is substantially complete.
2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 FINAL ACCEPTANCE TO MAKE FINAL PAYMENT

A. Procedures: Before requesting final inspection for certification of final acceptance and final payment the following has to be completed. List exceptions in the request.

1. Submit the final payment request at the end of the final phase of work with required releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
2. Submit a certified copy of the Design Professional's substantial completion inspection list of items that were to be completed and corrected, stating that each item has been completed or otherwise resolved for acceptance.
3. Record Drawings must have been submitted to the Design Professional and approved (paragraph A under 1.3, Item 3 above).
4. Maintenance and Operations manuals must have been submitted to the Design Professional and approved (paragraph A under 1.3, Item 3 above).
5. Submit specific warranties, final certifications and similar documents.
6. Any maintenance and operational training of Agency personnel must have been completed (paragraph A under 1.3, Item 3 above).
7. Consent of Surety (A.I.A. Form G707) Release of Claims and Contractor's Affidavit of Payment of Debts and Claims (A.I.A. Form G706) must be executed by the contractor and submitted to the Design Professional.
8. A final pay estimate must be submitted requesting 100% payment including retainage. The documents in item 7 must be attached to the Final Pay Request.
9. State of Idaho Tax Release. Request for Tax Release Form is included in the agreement and is to be submitted to the Idaho State Tax Commission. The Tax Release issued by the Tax Commission is to be submitted with Closeout Documents.

B. Final Inspection Procedure: The Design Professional will reinspect the Work upon receipt of notice that the Work, including punch list items from earlier inspections have been completed.

1. Upon completion of reinspection, the Design Professional will prepare a letter of final acceptance or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES

A. Operating and Maintenance Instructions: Arrange for each installer of equipment that requires regular maintenance to meet with the Owner/Agency's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:

1. Maintenance manuals.
2. Record documents.
3. Spare parts and materials (if any).
4. Tools.
5. Lubricants.
6. Fuels.
7. Identification systems.
8. Control sequences.
9. Hazards.
10. Cleaning.
11. Warranties.
12. Maintenance and similar continuing commitments.

3.2 FINAL ACCEPTANCE

A. The Contractor is required to submit to the Design Professional required documents.

1. The Design Professional will not approve final payment until all items have been received, reviewed and found to be acceptable and in compliance with the Contract Documents.

END OF SECTION 01700
SECTION 01781 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract and other Division-1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for Project Record Documents.

B. Project Record Documents required include:
   1. Marked-up (red line corrected) copies of Contract Drawings.
   2. Marked-up (red line corrected) copies of Shop Drawings and Product Data Submittals.
   3. Marked-up (red line corrected) copies of Specifications, addenda and Change Orders.
   4. Field records for variable and concealed conditions.

C. Specific record copy requirements that expand requirements of this Section are included in the individual Sections of Divisions-2 through -16.

D. General project closeout requirements are included in Division 1 Section "Project Closeout."

E. Maintenance of Documents: Store record documents in the field office apart from Contract Documents used for construction. Do not permit Project Record Documents to be used for construction purposes. Maintain record documents in good order, and in a clean, dry, legible condition. Make documents available at all times for inspection by the Design Professional.

1.3 RECORD DRAWINGS

A. Mark-up (red line corrected) Procedure: During the construction period, maintain a set of (1 copy) black-line white-prints of Contract Drawings and Shop Drawings for Project Record Document purposes.

   1. Mark these Drawings to indicate the actual installation where the installation varies appreciably from the installation shown originally. Give attention to information on concealed elements which would be difficult to identify or measure and record later. Items required to be marked include but are not limited to:

      a. Dimensional changes to the Drawings.
      b. Revisions to details shown on the Drawings.
      c. Locations and depths of underground utilities.
      d. Revisions to routing of piping and conduits.
      e. Revisions to electrical circuitry.
      f. Actual equipment locations.
      g. Locations of concealed internal utilities.
      h. Changes made by Change Order.
i. Details not on original Contract Drawings.

2. Mark completely and accurately record prints of Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions. Where Shop Drawings are marked, show cross-reference on Contract Drawings location.

3. Mark record sets with red erasable colored pencil; use other colors to distinguish between changes for different categories of the Work at the same location.

4. Mark important additional information which was either shown schematically or omitted from original Drawings.

5. Note construction change directive numbers, alternate numbers, Change Order numbers and similar identification.

6. Responsibility for Markup: Where feasible, the individual or entity who obtained record data, whether the individual or entity is the installer, subcontractor, or similar entity, is required to prepare the mark-up on record Drawings.
   a. Accurately record information in an understandable Drawing technique. Record drawings will be returned to the contractor to correct the information that is not understandable or not clearly annotated.
   b. Record data as soon as possible after it has been obtained. In the case of concealed installations, record and check the mark-up prior to concealment.

7. At time of Substantial Completion, submit record Drawings to Design Professional for Owner/Agency's records. Organize into sets, bind and label sets for Owner/Agency's continued use.

B. Copies and Distribution: After completing the preparation of record drawings bind each set with durable paper cover sheets, with appropriate identification, including titles, dates and other information on cover sheets prior to submitting to Design Professional for Owner/Agency's records.

1.4 RECORD SPECIFICATIONS

A. During the construction period, maintain one (1) copy of the Project Specifications, including addenda and modifications issued, for Project Record Document purposes.

1. Mark the Specifications to indicate the actual installation where the installation varies substantially from that indicated in Specifications and modifications issued. Note related Project Record Drawing information, where applicable. Give attention to information on concealed installations that would be difficult to identify or measure and record later.
   a. In each Specification Section where products, materials or units of equipment are specified or scheduled, mark the copy with the proprietary name and model number of the product furnished.
   b. Note related record Product Data, where applicable. For each principal product specified, indicate whether record Product Data has been submitted in maintenance manual instead of submitted as record Product Data.

2. Upon completion of mark-up, submit record Specifications to the Design Professional for Owner/Agency's records.
   a. The Contractor for General Construction is responsible for submitting the complete set of record Specifications as specified.
1.5 RECORD PRODUCT DATA

A. During the construction period, maintain one (1) copy of each Product Data submittal for Project Record Document purposes.

1. Mark Product Data to indicate the actual product installation where the installation varies substantially from that indicated in Product Data submitted. Include significant changes in the product delivered to the site, and changes in manufacturer's instructions and recommendations for installation.

2. Give attention to information on concealed products and installations that cannot be readily identified and recorded later.

3. Note related Change Orders and mark-up of record Drawings, where applicable.

4. Upon completion of mark-up, submit a complete set of record Product Data to the Design Professional for the Owner/Agency's records.

5. Where record Product Data is required as part of maintenance manuals, submit marked-up Product Data as an insert in the manual, instead of submittal as record Product Data.

1.6 MISCELLANEOUS RECORD SUBMITTALS

A. Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Immediately prior to Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Submit to the Design Professional for the Owner/Agency's records.

1. Categories of requirements resulting in miscellaneous records include, but are not limited to the following:
   
   a. Locations and elevations of underground lines.
   
   b. Certifications received in lieu of labels on bulk products.
   
   c. Final inspection and correction procedures.
   
   d. Inspections and certifications by governing authorities.
   
   e. Final inspection and correction procedures.

PART 2 - PRODUCTS (not applicable)

PART 3 - EXECUTION

3.1 RECORDING

A. Post changes and modifications to the Documents as they occur. Do not wait until the end of the Project. The Design Professional will periodically review record documents to assure compliance with this requirement.

END OF SECTION 01781
SECTION 01782 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Operation manuals for systems, subsystems, and equipment.
3. Maintenance manuals for the care and maintenance of systems and equipment as well as specialty products, materials, and finishes.

B. Related Sections include the following:

1. Division 1 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Division 1 Section "Closeout Procedures" for submitting operation and maintenance manuals.
3. Division 1 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
4. Divisions 2 through 16 Sections for specific operation and maintenance manual requirements for products in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

A. Initial Submittal: Submit (2) two draft copies of each manual at least (15) fifteen days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Design Professional will return (1 copy) of draft and mark whether general scope and content of manual are acceptable.

1. Final Submittal: Submit (3) copies of each manual in final form prior to substantial completion inspection.
1.5 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:
   1. List of documents.
   2. List of systems.
   3. List of equipment.
   4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with the same designation used in the Contract Documents.

2.2 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
   1. Title page.
   2. Table of contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
   1. Subject matter included in manual.
   2. Name and address of Project.
   3. Project Number.
   4. Name and address of Owner.
   5. Date of submittal.
   6. Name, address, and telephone number of Contractor.
   7. Name and address of Design Professional.
8. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (115-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

   a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.

   b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, Project Number and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.

4. Supplementary Text: Prepared on 8-1/2-by-11-inch (115-by-280-mm), 20-lb/sq. ft. (75-g/sq. m) white bond paper.

5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.

   b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Precautions against improper use.
9. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Engineering data and tests.
8. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Routine and normal operating instructions.
3. Regulation and control procedures.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

2.4 PRODUCT MAINTENANCE MANUAL

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
5. Reordering information for specially manufactured products.
D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
1. Do not use original Project Record Documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared Record Drawings in Division 1 Section "Project Record Documents."

F. Comply with Division 1 Section "Closeout Procedures" for the schedule for submitting operation and maintenance documentation.

END OF SECTION 01782
SECTION 02300 - EARTHWORK

PART 1 - GENERAL

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

1.2 SUMMARY
   A. The building site will be excavated and graded by ITD’s own Forces to an approximate 1”
      above or below -11” of finished shop floor elevation. The Contractor shall complete final (6”)
      ¾” minus base along with all concrete slab work, foundations etc. and other trenching
      excavations and backfill as required.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of the following manufactured products required:
      1. Geotextiles (if required).
      2. Controlled low-strength material, including design mixture (if required).
   B. Samples for Verification: For the following products, in sizes indicated below:
      2. Warning Tape: 12 inches long; of each color.

1.4 INFORMATIONAL SUBMITTALS
   A. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill
      as follows:
      1. Classification according to ASTM D 2487.
      2. Laboratory compaction curve according to ASTM D 698.

1.5 QUALITY ASSURANCE
   A. Blasting: Not allowed.
   B. Geotechnical Testing Agency Qualifications: See enclosed prepared by ITD.
1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

   1. Do not proceed with work on adjoining without written permission.

C. Utility Locator Service: Notify location services as required for area where Project is located before beginning earth moving operations.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Material under footings and foundations shall be compacted to the requirements of Class A in accordance with ITD Standard Specifications, Section 205 – Excavation and Embankment. All backfill around foundations and footings shall be an approved granular material placed and compacted to the requirements of Class A by the Contractor in accordance with Section 205.

B. Trash shall not be allowed to accumulate in spaces to be backfilled; such spaces shall be thoroughly cleaned before backfill is placed therein. Frozen particles, large stones, vegetable matter or trash shall not be used in fill or backfill.

C. Fill, which is exterior to the building site and not under Portland cement concrete, except driveways and approaches, will be considered non-load-bearing. Non-load-bearing fill shall be placed in layers of not more than 12-inch loose measurement and thoroughly compacted. Driveway and approach fills shall be compacted in accordance with all applicable provisions of ITD Standard Specifications, Section 205-Compaction, Class A. Compaction.

D. No fill or backfill shall be placed without approval.

E. The Contractor shall conduct work in an orderly manner and so as not to create a nuisance. Dirt shall not be permitted to accumulate on streets or sidewalks nor to be washed into sewers.

F. The Contractor shall remove from the site and legally dispose of all debris. Excavated material not required for fill shall be removed or spread on the site as directed.

2.2 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150
mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:

2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls installed by ITD during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

3.4 EXCAVATION

A. Excavation shall be made in accordance with the applicable provisions of ITD Standard Specifications, Section 210 – Excavation for Structures, and shall include all excavating and backfilling of sewers, water, plumbing, heating and electrical work. Provisions shall be made for the installation of all work as the building progresses. Cutting and patching to install omitted work shall be avoided.
B. Excavation shall be made to the indicated elevation or dimension plus sufficient space to permit erection of forms and shoring, to allow proper installation of below-grade materials, and to allow proper inspection of foundations and below-grade installations. Excavations shall be shored and braced if necessary to prevent cave-in. Such shoring and bracing shall be removed before backfill is completed, but not until permanent supports are in place. Excavations shall be kept free from water.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections.

3.6 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 02300
SECTION 02751 - CEMENT CONCRETE PAVEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes exterior cement concrete pavement for the following:
   1. Driveway approach to bays.
   2. Walkways.
   3. Joint Sealer

B. Related Sections include the following:
   1. Division 2 Section "Earthwork" for subgrade preparation, grading, and subbase course.
   2. Division 3 Section "Cast-in-Place Concrete" for general building applications of concrete.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of materials:

D. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
   1. Cementitious materials.
   2. Steel reinforcement and reinforcement accessories.

E. Field quality-control test reports.
F. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency ACI for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.


D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1. Before submitting design mixtures, review concrete pavement mixture design and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:

   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete producer.
   d. Concrete pavement subcontractor.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

1. Use flexible or curved forms for curves with a radius 100 feet (30.5 m) or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.


C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.

D. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60 (Grade 420), deformed bars; assembled with clips.

E. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

F. Hook Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

G. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

H. Epoxy Repair Coating: Liquid two-part epoxy repair coating, compatible with epoxy coating on reinforcement.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:
1. Portland Cement: ASTM C 150, Type I or II.
   a. Fly Ash: ASTM C 618, Class C.

B. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate, uniformly graded. Provide aggregates from a single source.
   1. Maximum Coarse-Aggregate Size: 1 inch nominal.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Exposed Aggregate: Selected, hard, and durable; washed; free of materials with deleterious reactivity to cement or that cause staining; from a single source, with gap-graded coarse aggregate as follows:
   1. Aggregate Sizes: 3/4 to 1 inch nominal.

D. Water: ASTM C 94/C 94M.


F. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
   1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
   2. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.
   1. Products:
      a. Axim Concrete Technologies; Cimfilm.
      b. Burke by Edeco; BurkeFilm.
      c. ChemMasters; Spray-Film.
      d. Conspec Marketing & Manufacturing Co., Inc.; Aquafilm.

E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
   1. Products:
a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
b. Burke by Edoko; Aqua Resin Cure.
c. ChemMasters; Safe-Cure Clear.

2.6 RELATED MATERIALS


B. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements, and as follows:
   1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.7 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
   1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:
   2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
   3. Slump Limit: 3 inches, plus or minus 1 inch.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
   1. Air Content: 4-1/2 percent plus or minus 1.5 percent for 1-1/2-inch nominal maximum aggregate size.
   2. Air Content: 4-1/2 percent plus or minus 1.5 percent for 1-inch nominal maximum aggregate size.
   3. Air Content: 5 percent plus or minus 1.5 percent for 3/4-inch nominal maximum aggregate size.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use plasticizing in concrete, as required, for placement and workability.

F. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements as follows:
   1. Fly Ash or Pozzolan: 25 percent.
2. Ground Granulated Blast-Furnace Slag: 50 percent.
3. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent, with fly ash or pozzolan not exceeding 25 percent.

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete mixes of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete mixes larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a loaded 10-wheel tandem-axle dump truck weighing not less than 15 tons.
3. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch require correction according to requirements in Division 2 Section "Earthwork."

C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.
3.3  EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4  STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Zinc-Coated Reinforcement: Use galvanized steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.

F. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.5  JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.

2. Provide tie bars at sides of pavement strips where indicated.

3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt-coat one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet, unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site.

F. Do not add water to fresh concrete after testing.

G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
   1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
   1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.

J. Screed pavement surfaces with a straightedge and strike off.

K. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

L. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

M. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
   2. Do not use frozen materials or materials containing ice or snow.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

N. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorbive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorbive covers.
2. **Moisture-Retaining-Cover Curing:** Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least **12 inches**, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. **Curing Compound:** Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.9 **PAVEMENT TOLERANCES**

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: **1/4 inch**.
2. Thickness: Plus **3/8 inch**, minus **1/4 inch**.
3. Surface: Gap below **10-foot-long**, unleveled straightedge not to exceed **1/4 inch**.
4. Lateral Alignment and Spacing of Tie Bars and Dowels: **1 inch**.
5. Vertical Alignment of Tie Bars and Dowels: **1/4 inch**.
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: **1/2 inch**.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel **1/4 inch per 12 inches**.
8. Joint Spacing: **3 inches**.

3.10 **FIELD QUALITY CONTROL**

A. Testing Agency: Construction Manager will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least 1 composite sample for each 50 cu. yd. or fraction thereof of each concrete mix placed each day.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.

4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is **40 deg F (4.4 deg C)** and below and when **80 deg F (27 deg C)** and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 02751
SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Foundation walls.
3. Slabs-on-grade.

B. Related Sections:

1. Section 02300 "Earthwork" for drainage fill under slabs-on-grade.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
1. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Curing compounds.
7. Floor and slab treatments.
10. Vapor retarders.
11. Semirigid joint filler.

D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

F. Field quality-control reports.

G. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
C. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade I, according to ACI CP-1 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

H. Mockups: Cast concrete slab-on-grade and formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.

1. Build panel approximately 100 sq. ft. for slab-on-grade and 25 sq. ft. for formed surface in the location indicated or, if not indicated, as directed by Architect.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

I. Preinstallation Conference: Conduct conference at Project site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete subcontractor.
   e. Special concrete finish subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation,
floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
   a. High-density overlay, Class 1 or better.
   b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
   c. Structural 1, B-B or better; mill oiled and edge sealed.
   d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.


E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.


F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish units that will leave no corrodbile metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
C. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60, ASTM A 706/A 706M, deformed bars, assembled with clips.
D. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.
E. Deformed-Steel Wire: ASTM A 496/A 496M.
F. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.
B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
   1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
   2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
   3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
   1. Portland Cement: ASTM C 150, Type I/II. Supplement with the following:
2. Blended Hydraulic Cement: ASTM C 595, Type IS, portland blast-furnace slag, Type IP, portland Pozzolan, Type I (PM), Pozzolan-modified portland, Type I (SM), slag-modified portland cement.

B. Silica Fume: ASTM C 1240, amorphous silica.

C. Normal-Weight Aggregates: ASTM C 33, Class 3S, Class 3M, Class 1N coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.


2.5 ADMIXTURES


B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Axim Italcementi Group, Inc.; CATEXOL CN-CI.
   b. BASF Construction Chemicals - Building Systems; Rheocrete CNI.
   c. Euclid Chemical Company (The), an RPM company;
   d. Grace Construction Products, W. R. Grace & Co.; DCI.
   e. Sika Corporation; Sika CNI.
D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. BASF Construction Chemicals - Building Systems; Rheocrete 222+.
   b. Cortec Corporation; MCI-2005NS.
   c. Grace Construction Products, W. R. Grace & Co.; DCI-S.
   d. Sika Corporation; FerroGard 901.

2.6 FIBER REINFORCEMENT

A. Synthetic Micro-Fiber: Monofilament or fibrillated polypropylene micro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1/2 to 1-1/2 inches, 1 to 2-1/4 inches long.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Monofilament Micro-Fibers:

      1) Axim Italcementi Group, Inc.; Fibrasol II P.
      2) Euclid Chemical Company (The), an RPM company; Fiberstrand 150.
      3) FORTA Corporation; FORTA Econo-Mono.
      5) Metalcrete Industries; Polystrand 1000.
      6) Nycon, Inc.; ProConM.
      7) Propex Concrete Systems Corp.; Fibermesh 150.
      8) Sika Corporation; Sika Fiber PPM.

   b. Fibrillated Micro-Fibers:

      1) Axim Italcementi Group, Inc.; Fibrasol F.
      2) Euclid Chemical Company (The), an RPM company; Fiberstrand F.
      3) FORTA Corporation; FORTA Ultra-Net.
      5) Nycon, Inc.; ProConF.
      6) Propex Concrete Systems Corp.; Fibermesh 300.
      7) Sika Corporation; Sika Fiber PPF.

B. Synthetic Macro-Fiber: Polyolefin macro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1 to 2-1/4 inches long.

1. Products: Subject to compliance with requirements, provide one of the following

   a. 3M; Scotchcast Polyolefin Fibers 2".
   b. Euclid Chemical Company (The), an RPM company; Tuf-Strand SF.
c. FORTA Corporation; FORTA FERRO.
e. Nycon, Inc.; XL.
f. Propex Concrete Systems Corp.; Fibermesh 650.
g. Sika Corporation; Sika Fiber MS10.

2.7 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Products: Subject to compliance with requirements, provide the following:
   a. Stego Industries, LLC; Stego Wrap 10 mil Class A.

B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

C. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.8 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. ChemMasters; Chemisil Plus.
   b. ChemTec Int'l; ChemTec One.
   c. Conspec by Dayton Superior; Intraseal.
   d. Curecrete Distribution Inc.; Ashford Formula.
   e. Dayton Superior Corporation; Day-Chem Sure Hard (J-17).
   f. Edoco by Dayton Superior; Titan Hard.
   g. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
   h. Kaufman Products, Inc.; SureHard.
   i. L&M Construction Chemicals, Inc.; Seal Hard.
   j. Meadows, W. R., Inc.; LIQUI-HARD.
   k. Metalcrete Industries; Floorsaver.
   l. Nox-Crete Products Group; Duro-Nox.
   m. Symons by Dayton Superior; Buff Hard.
   n. US SPEC, Division of US Mix Products Company; US SPEC Industraseal.
   o. Vexcon Chemicals, Inc.; Vexcon StarSeal PS Clear.
2.9 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Axim Italcementi Group, Inc.; CATEXOL CimFilm.
   b. BASF Construction Chemicals - Building Systems; Confilm.
   c. ChemMasters; SprayFilm.
   d. Conspec by Dayton Superior; AquaFilm.
   e. Dayton Superior Corporation; Sure Film (J-74).
   f. Edoco by Dayton Superior; BurkeFilm.
   g. Euclid Chemical Company (The), an RPM company; Eucobar.
   h. Kaufman Products, Inc.; Vapor-Aid.
   i. Lambert Corporation; LAMBCO Skin.
   j. L&M Construction Chemicals, Inc.; E-CON.
   k. Meadows, W. R., Inc.; EVAPRE.
   l. Metalcrete Industries; Waterhold.
   m. Nox-Crete Products Group; MONOFILM.
   n. Sika Corporation; SikaFilm.
   o. SpecChem, LLC; Spec Film.
   p. Symons by Dayton Superior; Finishing Aid.
   q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
   r. Unitex; PRO-FILM.
   s. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
   b. BASF Construction Chemicals - Building Systems; Kure 200.
   c. ChemMasters; Safe-Cure Clear.
   d. Conspec by Dayton Superior; W.B. Resin Cure.
   e. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
   f. Edoco by Dayton Superior; Res X Cure WB.
   g. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
   i. Lambert Corporation; AQUA KURE - CLEAR.
   j. L&M Construction Chemicals, Inc.; L&M Cure R.
k. Meadows, W. R., Inc.; 1100-CLEAR.
l. Nox-Crete Products Group; Resin Cure E.
m. Right Pointe; Clear Water Resin.

n. SpecChem, LLC; Spec Rez Clear.
o. Symons by Dayton Superior; Resi-Chem Clear.
p. TK Products, Division of Sierra Corporation; TK-2519 DC WB.
q. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

F. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type I, Class A.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. BASF Construction Chemicals - Building Systems; Kure-N-Seal 25 LV.
   b. ChemMasters; Spray-Cure & Seal Plus.
   c. Conspec by Dayton Superior; Sealcure 1315.
   d. Dayton Superior Corporation; Day-Chem Cure and Seal (J-22UV).
   e. Edoco by Dayton Superior; Cureseal 1315.
   f. Euclid Chemical Company (The), an RPM company; Super Diamond Clear; LusterSeal 300.
   g. Kaufman Products, Inc.; Sure Cure 25.
   h. Lambert Corporation; UV Super Seal.
   i. L&M Construction Chemicals, Inc.; Lumiseal Plus.
   k. Metalcrete Industries; Seal N Kure 30.
   l. Right Pointe; Right Sheen 30.
   m. Vexcon Chemicals, Inc.; Certi-Vex AC 1315.

2. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.10 RELATED MATERIALS


B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.

C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

   1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
E. Reglets: Fabricate reglets of not less than 0.022-inch thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

F. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6.4 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 20 percent.
2. Combined Fly Ash and Pozzolan: 20 percent.
3. Ground Granulated Blast-Furnace Slag: 40 percent.
4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 40 percent portland cement minimum, with fly ash or pozzolan not exceeding 20 percent.
5. Silica Fume: 5 percent.
6. Combined Fly Ash, Pozzolans, and Silica Fume: 30 percent with fly ash or pozzolans not exceeding 20 percent and silica fume not exceeding 5 percent.
7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 40 percent with fly ash or pozzolans not exceeding 20 percent and silica fume not exceeding 5 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
   4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

E. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: Proportion normal-weight concrete mixture indicated on plans.

B. Foundation Walls: Proportion normal-weight concrete mixture indicated on plans.

C. Slabs-on-Grade: Proportion normal-weight concrete mixture indicated on plans.

D. Building Walls: Proportion normal-weight concrete mixture indicated on plans.

2.14 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.15 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.
   1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.
B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:


D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 75 percent of its 28-day design compressive strength.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.6 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

G. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780. Use galvanized steel wire ties to fasten zinc-coated steel reinforcement.
3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls at 50’ 0.c. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Section 07920 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.
3.8  CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
   1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
   1. Apply to concrete surfaces exposed to public view.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
   1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
   2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
   3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.
3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic, paint, or another thin-film-finish coating system.

2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:

   a. Specified overall values of flatness, F(F) 25; and of levelness.

3. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.-long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.12 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after
loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
   a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than three days old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.14 JOINT FILLING
A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
   1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.
B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS
A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
   1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
   2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
   3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.16 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner may engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:
1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
7. Compression Test Specimens: ASTM C 31/C 31M.
   a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
   b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
   a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
   b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.

14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

3.17 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 03300
SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Section Includes:
      1. Metal bollards.
      2. Truck wash platform & stair & railing

1.3 ACTION SUBMITTALS
   A. Shop Drawings: Show fabrication and installation details for metal fabrications.
      1. Include plans, elevations, sections, and details of metal fabrications and their
         connections. Show anchorage and accessory items.
      2. Submit drawings & calculations prepared by Registered Professional, Licensed in Idaho,
         Structural Engineer.

1.4 PROJECT CONDITIONS
   A. Field Measurements: Verify actual locations of walls and other construction contiguous with
      metal fabrications by field measurements before fabrication.

1.5 COORDINATION
   A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint
      and coating manufacturers' written recommendations to ensure that shop primers and topcoats
      are compatible with one another.

PART 2 - PRODUCTS

2.1 METALS, GENERAL
   A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise
      indicated. For metal fabrications exposed to view in the completed Work, provide materials
      without seam marks, roller marks, rolled trade names, or blemishes.
2.2 MISCELLANEOUS MATERIALS
A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

B. Concrete: Comply with requirements in Section 03300 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 4000 psi.

2.3 FABRICATION, GENERAL
A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

2.4 METAL BOLLARDS
A. Fabricate metal bollards from Schedule 40 steel pipe.

B. Prime bollards with zinc-rich primer.

C. Fabricate truck wash steel from Schedule 40/galvanized steel.

2.5 STEEL AND IRON FINISHES
A. Shop prime iron and steel items unless they are to be embedded in concrete or unless otherwise indicated.

1. Shop prime with universal shop primer.

B. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning".

C. Galvanized at truck wash platform.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL
A. Cutting, Fitting, and Placement: Perform cutting and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges
and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 INSTALLING METAL BOLLARDS/TRUCK WASH PLATFORM

A. Anchor steel in place with concrete footings. Center and align bollards in holes 3 inches above bottom of excavation. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured. Anchor truck wash platform per Engineered System prepared by Registered Professional Structural Engineer.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

END OF SECTION 05500
SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Framing with dimension lumber.
   2. Framing with engineered wood products (provide engineering).
   3. Shear wall panels.
   4. Wood blocking, cants and nailers.
   5. Plywood backing panels.

B. Related Requirements:
   1. Section 06160 "Sheathing."

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
   2. NLGA: National Lumber Grades Authority.
   3. RIS: Redwood Inspection Service.
   5. WCLIB: West Coast Lumber Inspection Bureau.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:
   1. Engineered wood products.
   2. Metal framing anchors.

C. Engineering calculations for all framing, i.e., studs, connections, joists, sheathing, etc.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
   3. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal unless otherwise indicated.

C. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

   1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
2.2 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade.
   1. Application: Interior partitions not indicated as load-bearing.
   2. Species:
      a. Hem-fir (north); NLGA.
      b. Spruce-pine-fir; NLGA.
      c. Hem-fir; WCLIB, or WWPA.
      d. Northern species; NLGA.
      e. Western woods; WCLIB or WWPA.

B. Load-Bearing Partitions: No. 2 grade.
   2. Species:
      a. Hem-fir (north); NLGA.
      b. Douglas fir-larch; WCLIB or WWPA.
      c. Spruce-pine-fir; NLGA.
      d. Hem-fir; WCLIB or WWPA.
      e. Douglas fir-larch (north); NLGA.

2.3 ENGINEERED WOOD PRODUCTS

A. Engineered Wood Products, General: Products shall contain no urea formaldehyde.

B. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.

C. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   b. Georgia-Pacific.
   c. Louisiana-Pacific Corporation.
   d. Red Built.
   e. Roseburg Forest Products Co.
   f. Weyerhaeuser Company.

2. Extreme Fiber Stress in Bending: As required to support loads. Provide Engineering Design and calculations for review to Architect.

D. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Louisiana-Pacific Corporation.
   b. Red Built
   c. Weyerhaeuser Company.

2. Extreme Fiber Stress in Bending: As required to support loads. Provide Engineering Design and calculations for review to Architect.


E. Wood I-Joists: Prefabricated units, I-shaped in cross section, made with solid or structural composite lumber flanges and wood-based structural panel webs, let into and bonded to flanges. Provide units complying with material requirements of and with structural capacities established and monitored according to ASTM D 5055.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Anthony-Domtar Inc.
   b. Boise Cascade Corporation.
   c. Georgia-Pacific.
   d. J. M. Huber Corporation.
   e. International Beams Inc.
   f. International Paper Corporation.
   g. Jager Building Systems Inc.
   h. Louisiana-Pacific Corporation.
   i. Nascor Incorporated.
   j. Pacific Woodtech Corporation.
   k. Red Built
   l. Roseburg Forest Products Co.
   m. Standard Structures Inc.
   n. Stark Truss Company, Inc.
   o. Superior Wood Systems.
   p. Weyerhaeuser Company.

2. Web Material: Either oriented strand board or plywood, complying with DOC PS 1 or DOC PS 2, Exposure 1.

3. Structural Properties: Provide units with depths and design values not less than those indicated.

F. Rim Boards: Product designed to be used as a load-bearing member and to brace wood I-joists at bearing ends, complying with research/evaluation report for I-joists.
1. Manufacturer: Provide products by same manufacturer as I-joists.
3. Thickness: As required.

2.4 SHEAR WALL PANELS

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. Shear Transfer Systems.
2. Simpson Strong-Tie Co., Inc.
3. Weyerhaeuser Company.

B. Wood-Framed Shear Wall Panels: Prefabricated assembly consisting of wood perimeter framing, tie downs, and Exposure I, Structural I plywood or OSB sheathing.

C. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those required. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.

B. For items of dimension lumber size, provide and any of the following species:

1. Hem-fir (north); NLGA.
2. Spruce-pine-fir; NLGA.
3. Hem-fir; WCLIB or WWPA.
4. Western woods; WCLIB or WWPA.
5. Northern species; NLGA.
6. Eastern softwoods; NeLMA.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and following species and grades:

1. Hem-fir or hem-fir (north); Construction or No. 2 Common grade, NLGA, WCLIB, or WWPA.
2. Eastern softwoods; No. 2 Common grade; NeLMA.
3. Northern species; No. 2 Common grade; NLGA.
4. Western woods; Construction or No. 2 Common grade; WCLIB or WWPA.
D. For blocking not used for attachment of other construction, Utility or Stud grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

2.6 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exterior, C-C Plugged in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

1. Plywood shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservation treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.


D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.


2.8 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. Cleveland Steel Specialty Co.
2. KC Metals Products, Inc.
3. Phoenix Metal Products, Inc.
4. Simpson Strong-Tie Co., Inc.
5. USP Structural Connectors.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those required. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.


1. Use for interior locations unless otherwise indicated.

D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.

1. Use for wood-preservative-treated lumber and where indicated.

E. I-Joist Hangers: U-shaped joist hangers with 2-inch- long seat and 1-1/4-inch-wide nailing flanges full depth of joist. Nailing flanges provide lateral support at joist top chord.

1. Thickness: As required (provide engineering typical all framing).

F. Bridging: Rigid, V-section, nailless type, 0.050 inch thick, length to suit joist size and spacing.

G. Floor-to-Floor Ties: Flat straps, with holes for fasteners, for tying upper floor wall studs to band joists and lower floor studs, 1-1/4 inches wide by 0.050 inch thick by 36 inches long.

H. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts or to other hold-downs with threaded rods and designed with first of two bolts placed seven bolt diameters from reinforced base.

1. Bolt Diameter: As required (provide Engineering).
2. Width: As required (provide Engineering).
3. Body Thickness: As required (provide Engineering).
4. Base Reinforcement Thickness: As required (provide Engineering).

2.9 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.
PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

E. Shear Wall Panels: Install shear wall panels to comply with manufacturer's written instructions.

F. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

G. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

H. Do not splice structural members between supports unless otherwise indicated.

I. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

   1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

J. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

   1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.

   2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal-thickness.

   3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.

   4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
K. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

L. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. NES NER-272 for power-driven fasteners.

M. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

3.3 WALL AND PARTITION FRAMING INSTALLATION

A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs. Fasten plates to supporting construction unless otherwise indicated.

1. For interior and exterior walls, provide 2-by-6-inch nominal and 2-by-4 inch nominal size wood studs spaced 16 inches o.c. unless otherwise indicated.
2. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high using members of 2-inch nominal thickness and of same width as wall or partitions.

B. Construct corners and intersections with three or more studs.

C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.
2. For load-bearing walls, provide double-jamb studs for openings 60 inches and less in width, and triple-jamb studs for wider openings. Provide headers of depth required. Provide Engineering Calculations for all framing.

D. Provide diagonal bracing per Engineering Calculations.

3.4 FLOOR JOIST FRAMING INSTALLATION

A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:

1. Where supported on wood members, by using metal framing anchors.
2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.

B. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.

C. Do not cut, drill or notch joists without engineered elevation.

D. Provide solid blocking per Engineered calculations.

E. Provide solid blocking between joists under jamb studs for openings.

3.5 STAIR FRAMING INSTALLATION

A. Provide stair framing members of size, space, and configuration per Engineered Calculations.

B. Provide stair framing with no more than 3/16-inch variation between adjacent treads and risers and no more than 3/8-inch variation between largest and smallest treads and risers within each flight.

3.6 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06100
SECTION 06160 - SHEATHING

PART 1 - GENERAL

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

1.2 SUMMARY
A. Section Includes:
   1. Wall sheathing.
   2. Subflooring.
B. Related Requirements:
   1. Section 06100 "Rough Carpentry” for plywood backing panels.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1.4 DELIVERY, STORAGE, AND HANDLING
A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS
A. Plywood: Either DOC PS 1 or DOC PS 2 unless otherwise indicated.
B. Thickness: 5/8” at wall.
C. Factory mark panels to indicate compliance with applicable standard.
2.2 WALL SHEATHING

A. Plywood Wall Sheathing: Exterior, Exposure 1, **BC** (interior finish with “B” side out).

B. Plywood Wall Sheathing: Exterior, Exposure 1, **CD** (where concealed).

2.3 SUBFLOORING

A. Plywood Subflooring: Exterior, Structural I, single-floor panels or sheathing.
   
   1. Span Rating: Not less than 32/16.
   2. Nominal Thickness: Not less than ¾ inch.

2.4 FASTENERS

A. General: Provide fasteners of size and type required that comply with requirements specified in this article for material and manufacture.

   1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.


PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening with screws.

END OF SECTION 06160
SECTION 06402 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Plastic-laminate cabinets.
   2. Plastic-laminate countertops.

1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, including cabinet hardware and accessories and finishing materials and processes.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show details full size.
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets and other items installed in architectural woodwork.
   4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.

C. Samples for Initial Selection:
   1. Plastic laminates (PL).
   2. PVC edge material.
   3. Thermoset decorative panels (TDP).

1.5 QUALITY ASSURANCE

A. Fabricator and Installer Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
B. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section 01200 “Project Meetings”.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.7 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of AWI’s quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Products: Comply with the following:
1. Moisture Resistant Particleboard: Grade M-3, 47 lb. density.
2. Particleboard: ANSI A208.1, Grade M-3, 47 lb. density for material up to 7/8” thick and M-2, 45 lb. density for 1” and thicker.
3. Exterior grade plywood.


D. Edge Treatment: Provide 3 mm PVC edge banding complying with LMA EDG-1 on components with exposed or semiexposed edges.

E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
1. VGS (.028)
2. HGS (.048)
3. HGP (.039)
4. CLS (.020)
5. BKH (.048)
6. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:
   a. Formica Corporation.
   b. Wilsonart

2.2 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening, self-closing.

C. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

D. Shelf Rests: Heavy duty plastic 2 pen locking shelf support, clear. Shelf Lock II manufactured by PX Cabinet Hardware.

E. Door Locks: Lock all storage cabinets.

F. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
   1. Satin Stainless Steel: BHMA 630.

G. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.3 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

D. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

E. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Wood Glues: 30 g/L.
   2. Contact Adhesive: 250 g/L.
F. Adhesive for Bonding Plastic Laminate: As recommended by installer and approved by laminate manufacturer.
   1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.4 FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide Premium-grade interior woodwork complying with referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
   1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.

E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
   1. Seal edges of openings in countertops with a coat of varnish.

F. Fabrication casework, countertops and related products to dimensions, profiles, and details shown.
   1. Cabinet Body Construction:
      a. Tops and bottoms are glued and doweled to cabinet sides and internal cabinet components such as fixed horizontals, rails and verticals. Minimum 6 dowels each joint for 24 inch deep cabinets and a minimum of 4 dowels each joint for 12 inch deep cabinets. **Mechanical fasteners will not be accepted for cabinet body construction.**
         1) Bottoms and sides of all cabinets except sink base units are ¾” particleboard core.
         2) Bottoms and sides of sink base units are moisture resistant ¾” particleboard core.
   2. Cabinet backs: 1/4 inch thick TDP. Wall and tall cabinets are provided with a 1 inch x 1-3/4 inch PVC mounting strip used to secure the cabinet to the wall.
3. Fixed base units have an individual factory-applied base, constructed of 3/4 inch thick exterior grade plywood. Base is 4 inch high unless otherwise indicated on the drawings.

4. Side panels and vertical dividers shall receive adjustable shelf hardware at 32mm line boring centers. Mount door hinges, drawer slides and pull-out shelves in the line boring for consistent alignment.

5. Exposed and semi exposed edges.
   a. Edging: 3 mm PVC.

6. Adjustable shelf core: 3/4 inch thick particleboard up to 36 inches wide, 1 inch thick particleboard over 36 inches wide.
   a. Front edge: 3 mm PVC

7. Exposed ends:
   a. Faced with VGS high-pressure decorative laminate.

8. Wall unit bottom:
   a. Faced with thermally fused melamine laminate.

9. **Balanced construction of all laminated panels is mandatory.** Unfinished core stock surfaces, even on concealed surfaces (excluding edges), not permitted.

2.5 **PLASTIC-LAMINATE CABINETS**

A. Grade: Premium.

B. AWI Type of Cabinet Construction: Flush overlay.

C. Materials and Sizes of Panel Products:
   1. Cabinet Body: ¾”.
   2. Cabinet Backs: ¼”.
   3. Doors: ¾”.
   4. Shelves: Up to 3’-0” = ¾, 3’-1” to 4’-0” = 1”
   5. Drawer sides: ½”
   6. Drawer bottoms: ¼”

D. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
   1. Horizontal Surfaces: Grade HGS.
   2. Vertical Surfaces: Grade VGS.
   3. Edges: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.

E. Materials for Semiexposed Surfaces:
   1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.
      a. Edges of Plastic-Laminate Shelves: PVC edge banding, 0.12 inch (3 mm) thick, matching laminate in color, pattern, and finish.
      b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade CLS.
   2. Drawer Sides and Backs: Thermoset decorative panels (TDP).
   3. Drawer Bottoms: Thermoset decorative panels (TDP).

F. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.
G. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
   1. As selected by Architect from laminate manufacturer's full range in the following categories:
      a. Solid colors, matte finish.
      b. Wood grains, matte finish.
      c. Patterns, matte finish.

H. Provide dust panels of 1/4-inch plywood above compartments and drawers, unless located directly under tops.

2.6 PLASTIC-LAMINATE COUNTERTOPS

A. Grade: Premium.

B. High-Pressure Decorative Laminate Grade: HGS.

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
   1. As selected by Architect from manufacturer's full range in the following categories:
      a. Solid colors, matte finish.
      b. Wood grains, matte finish.
      c. Patterns, matte finish.

D. Grain Direction: Parallel to cabinet fronts.

E. Edge Treatment: Same as laminate cladding on horizontal surfaces.

F. Core Material: 1-1/4” particle board.

G. Core Material at Sinks: Exterior-grade plywood.

H. Backsplashes: ¾” particle board.

I. Backer Sheet: Provide plastic-laminate backer sheet, Grade BKL, on underside of countertop substrate.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.
3.2 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
2. Maintain veneer sequence matching of cabinets with transparent finish.
3. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for 1-inch (25-mm) penetration into wood framing, blocking, or hanging strips or No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
2. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
3. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c. and to walls with adhesive.
4. Caulk space between backsplash and wall with sealant specified in Division 7 Section "Joint Sealants" and color selected by Architect from full range of manufacturer standards.

H. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06402
SECTION 06640 - PLASTIC PANELING

PART 1 - GENERAL

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

1.2 SUMMARY
A. Section Includes:
   1. Plastic sheet paneling.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.
   B. Samples: For plastic paneling and trim accessories in manufacturer's standard sizes.

1.4 PROJECT CONDITIONS
A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight 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

2.1 MANUFACTURERS
A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

2.2 PLASTIC SHEET PANELING
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Crane Composites, Inc.
   b. Glasteel.
   c. Marlite.
   d. Newcourt, Inc.
   e. Parkland Plastics, Inc.

2. Surface-Burning Characteristics: As follows when tested by a qualified testing agency according to ASTM E 84. Identify products with appropriate markings of applicable testing agency.
   a. Flame-Spread Index: 25 or less.
   b. Smoke-Developed Index: 450 or less.

3. Nominal Thickness: Not less than 0.075 inch.
5. Color: To be selected from full range of colors.

2.3 ACCESSORIES

A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.

   1. Color: To be selected from full range of colors.

B. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.

C. Adhesive: As recommended by plastic paneling manufacturer and with a VOC content of 50 g/L or less.

D. Sealant: Latex sealant recommended by plastic paneling manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove materials that might interfere with adhesive bond.
B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.

C. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.

D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

E. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels and so that trimmed panels at corners are not less than 12 inches wide.
   1. Mark plumb lines on substrate at trim accessory and panel joint locations for accurate installation.
   2. Locate trim accessories and panel joints to allow clearance at panel edges according to manufacturer's written instructions.

3.3 INSTALLATION

A. Install plastic paneling according to manufacturer's written instructions.

B. Install panels in a full spread of adhesive.

C. Install trim accessories with nails. Do not fasten through panels. (Top, joint & edge trim required).

D. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

E. Maintain uniform space between adjacent panels and between panels and floors, ceilings, and fixtures. Fill space with sealant.

F. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION 06640
SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Insulation under slabs-on-grade.
2. Glass-fiber blanket
3. Vapor retarders.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Samples for Verification: Full-size units for each type of exposed insulation indicated.
C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.
D. Research/Evaluation Reports: For foam-plastic insulation.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source.
B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.


1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect plastic insulation as follows:
1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Extruded-Polystyrene Board Insulation:
   a. Dow Chemical Company.
   b. Owens Corning.

2. Glass-Fiber Insulation:
   a. CertainTeed Corporation.
   c. Knauf Fiber Glass.
   d. Owens Corning.

2.2 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.

1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.

B. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indices of 75 and 450, respectively:

   1. Type IV, 25 psi, unless otherwise indicated.
   2. 2” thick under slab & inside interior where shown.

C. Glass-Fiber Blanket, Unfaced: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics. See drawings for locations for the following R-values; R-15, R-19, R-13.

2.3 VAPOR RETARDERS (For V-B at Metal Building See Section 13125)

A. Polyethylene Vapor Retarders: ASTM D 4397, 10 mils thick, with maximum permeance rating of 0.13 perm (7.5ng/Pa x s x sq.m).

B. Fire-Retardant, Reinforced-Polyethylene Vapor Retarders: Two outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nonwoven grid of nylon cord or
polyester scrim and weighing now less than 22 lb/1000 sq. ft. (10kg/100 sq. m), with maximum permeance rating of 0.1317 perm (7.56 ng/Pa x s x sq. m) and with flame-spread and smoke-developed indexes of not more than 5 and 60, respectively, per ASTM E 84. (10 Mil minimum).

C. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for Sections in which substrates and related work are specified and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

B. Close off openings in cavities receiving poured-in-place insulation to prevent escape of insulation. Provide bronze or stainless-steel screens (inside) where openings must be maintained for drainage or ventilation.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION (Including Interior)

A. On vertical and horizontal surfaces to depth and widths indicated, set units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.
B. Protect top surface of horizontal insulation from damage during concrete work by applying protection board.

3.5 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Set vapor-retarder-faced units with vapor retarder to warm side of construction.
   1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

C. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
   1. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
   2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
   3. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to produce airtight installation after concealing finish material is in place.

3.6 INSTALLATION VAPOR RETARDERS (for V.B. @ Metal Building see Section 13125)

A. Place vapor retarders on side of construction indicted on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.
   1. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder Fasteners as recommended by vapor-retarder manufacturer.

C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.7 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07210
SECTION 07728 - SNOW GUARDS

PART 1 – GENERAL

1.1 SUMMARY

A. WORK INCLUDES
   1. ASG4025 Snow guard that does not penetrate the roof using clamp to seam.
   2. See Exterior Elevation & Details Sheets A 3.0 and A 3.1 for proper placement of the snow guards.
   3. Provide appropriate snow guard and fasteners for the metal standing seam with double fold RIDS

B. RELATED SECTIONS
   1. Section 13125 – Metal Building Sections.

1.2 SYSTEM DESCRIPTION

A. COMPONENTS:
   1. ASG4025 Snow guard system consists of snow guard bracket and (3) set screws.
   2. Tubing (Snow Fence).
   3. Couplings.
   4. End Caps.
   5. End Collars.
   6. Ice Flags.

B. DESIGN REQUIREMENTS:
   1. If manufacturer of Rail Type Snow Guard Spacing was determined by Alpine Snowguard Inc.
   2. Install a minimum of (3) set screws per snow guard.

1.3 SUBMITTAL

A. Submit manufacturer's specifications, standard detail drawings, installation instructions, and recommended layout.

1.4 QUALITY ASSURANCE

A. Installer to be experienced in the installation of specified roofing material and snow guards for not less than 5 years in the area of the project.

1.5 DELIVERY / STORAGE / HANDLING

A. Inspect material upon delivery and order replacements for any missing or defective items. Keep material dry, covered and off the ground until installed.
PART 2 – PRODUCTS

2.1 MANUFACTURER

A. Alpine SnowGuards. A division of Vermont Slate & Copper Services Inc.
   289 Harrel St. Morrisville, VT 05661, (888) 766-4273

2.2 MATERIALS

A. Snow Guard Bracket - 6000 Series Aluminum.

B. Tubing (choose one):
   1. Stainless Steel – 304 alloy, 1” outside diameter & .120” wall thickness, welded.

C. Couplings:
   1. Stainless Steel – 304 Series
      a. Internal and concealed coupling 3” long.
      b. External and exposed coupling which can also serve as an expansion mechanism 5” long.

D. End Caps - 304 Stainless Steel.

E. End Collars:
   a. 304 Stainless Steel.

F. Ice Flags (choose one):
   a. 6000 Series Aluminum 3” wide x length (as needed)
   b. 304 Stainless Steel.

2.3 FINISH:

A. Mill Finish – standard

PART 3 – EXECUTION

3.1 EXAMINATION

A. Substrate
   1. Inspect structure on which snow guard system is to be installed and verify that it will withstand any additional loading that it may incur. Notify general contractor of any deficiencies before installing Alpine SnowGuards.
   2. Verify that roofing material has been installed correctly prior to installing snow guards.
3.2 INSTALLATION

A. Comply with architectural drawings and snow guard manufacturer’s requirements for location of system. Comply with manufacturer's written installation instructions for installation and layout.

END OF SECTION 07728
SECTION 07920 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Urethane joint sealants.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.

1.6 QUALITY ASSURANCE

A. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.
1.7 PRECONSTRUCTION TESTING

A. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adherence to Project joint substrates as follows:

1. Locate test joints around doors and at concrete expansion joints.

1.8 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adherence have not yet been removed from joint substrates.

1.9 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.
2.2 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

   a. Concrete.

3. Remove laitance and form-release agents from concrete.

4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

   a. Metal.
B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.

1. Joint Locations:
   a. Isolation and contraction joints in cast-in-place concrete slabs.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.


1. Joint Locations:
   a. Joints between metal panels.
   b. Perimeter joints between materials listed above and frames of doors, windows and louvers.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.

1. Joint Locations:
a. Control joints on exposed interior surfaces of exterior walls.
b. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
c. Other joints as required.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 07920
SECTION 08110 - STEEL DOOR AND FRAME

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes hollow-metal work.

B. Related Requirements:
   1. Section 08710 "Door Hardware" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include the following:
   1. Elevations of each door type.
   2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of anchorages, joints, field splices, and connections.
   7. Details of accessories.
1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
   1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Steelcraft; an Ingersoll-Rand company.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 INTERIOR DOORS AND FRAMES

1. Frames:
   a. Materials: Uncoated and Metallic-coated, steel sheet, minimum thickness of 0.067 inch. (16 ga)
   b. Construction: Full profile welded.


2.3 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

   1. Physical Performance: Level A according to SDI A250.4.
   2. Doors:
      a. Type: As indicated in the Door and Frame Schedule.
c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (18 ga), with minimum A60 coating.
d. Edge Construction: Model 2, Seamless and factory welded.
e. Core: Vertical steel-stiffener core.
   1) Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu (0.370 K x sq.m/W) when tested according to ASTM C 1363.

3. Frames:
   a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum A60 coating.
   b. Construction: Full profile welded.


2.4 FRAME ANCHORS

A. Jamb Anchors:
   1. Stud Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
   1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
   2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.5 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
   1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

C. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

D. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
E. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

G. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.6 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:

1. **Steel-Stiffened Door Cores**: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.


3. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.

4. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.

5. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.

3. Jamb Anchors: Provide number and spacing of anchors as follows:

   a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

      1) Three anchors per jamb up to 60 inches high.

4. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
5. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

6. Terminated Stops: Terminate stops 6 inches above finish floor with a 45-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

2.7 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

   a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
   b. Install frames with removable stops located on secure side of opening.
   c. Install door silencers in frames before grouting.
   d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
   e. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
   f. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

   a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors:

   a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
   b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
c. At Bottom of Door: 3/4 inch plus or minus 1/32 inch.
d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08110
SECTION 08361 - SECTIONAL OVERHEAD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes electrically operated sectional doors.

B. Related Sections:

1. Section 09911 "Exterior Painting" and Section 09912 "Interior Painting" for finish painting of factory-primed doors.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Sectional doors shall meet performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.

B. Delegated Design: Design sectional doors, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Structural Performance: Exterior sectional doors shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Wind Loads: Uniform pressure (velocity pressure) of 20 lbf/sq. ft., acting inward and outward.

   a. Basic Wind Speed: 90 mph.

2. Deflection Limits: Design sectional doors to withstand design wind loads without evidencing permanent deformation or disengagement of door components. Deflection of door in horizontal position (open) shall not exceed 1/120 of the door width.

D. Air Infiltration: Maximum rate not more than indicated when tested according to ASTM E 283 or DASMA 105.
E. Windborne-Debris-Impact-Resistance Performance: Provide glazed sectional doors that pass large-missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and ASTM E 1996.

F. Seismic Performance: Sectional doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
2. Seismic Component Importance Factor: 1.5.

G. Operation Cycles: Provide sectional door components and operators capable of operating for not less than number of cycles indicated for each door. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1.4 ACTION SUBMITTALS

A. Product Data: For each type and size of sectional door and accessory. Include the following:

1. Construction details, material descriptions, dimensions of individual components, profile door sections, and finishes.
2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Flat Door Sections: 6 inches square.

D. Delegated-Design Submittal: For sectional doors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Detail fabrication and assembly of seismic restraints.
2. Summary of forces and loads on walls and jambs.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sectional doors to include in maintenance manuals.
1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

B. Source Limitations: Obtain sectional doors from single source from single manufacturer.
   1. Obtain operators and controls from sectional door manufacturer.

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.

D. Standard for Sectional Doors: Fabricate sectional doors to comply with DASMA 102 unless otherwise indicated.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including, but not limited to, excessive deflection.
      b. Faulty operation of hardware.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use; rust through.
      d. Delamination of exterior or interior facing materials.
   2. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 STEEL DOOR SECTIONS

A. Exterior Section Faces and Frames: Fabricate from zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, with indicated zinc coating and thickness.
   1. Fabricate section faces from single sheets to provide sections not more than 24 inches high and of indicated thickness. Roll horizontal meeting edges to a continuous, interlocking, keyed, rabbeted, shiplap, or tongue-in-groove weathertight seal, with a reinforcing flange return.
2. For insulated doors, provide sections with continuous thermal-break construction, separating the exterior and interior faces of door.

B. Section Ends and Intermediate Stiles: Enclose open ends of sections with channel end stiles formed from galvanized-steel sheet not less than 0.064-inch-nominal coated thickness and welded to door section. Provide intermediate stiles formed from not less than 0.064-inch-thick galvanized-steel sheet, cut to door section profile, and welded in place. Space stiles not more than 48 inches apart.

C. Reinforce bottom section with a continuous channel or angle conforming to bottom-section profile.

D. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Provide galvanized-steel bars, struts, trusses, or strip steel, formed to depth and bolted or welded in place. Ensure that reinforcement does not obstruct vision lites.

E. Provide reinforcement for hardware attachment.

F. Foamed-in-Place Thermal Insulation: Insulate interior of steel sections with door manufacturer's standard CFC-free polyurethane insulation, foamed in place to completely fill interior of section and pressure bonded to face sheets to prevent delamination under wind load, and with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within steel sections that incorporate the following interior facing material, with no exposed insulation:

1. Interior Facing Material: Zinc-coated (galvanized), cold-rolled, commercial steel (CS) sheet, complying with ASTM A 653/A 653M, with indicated thickness.

G. Fabricate sections so finished door assembly is rigid and aligned, with tight hairline joints and free of warp, twist, and deformation.

2.2 TRACKS, SUPPORTS, AND ACCESSORIES

A. Tracks: Manufacturer's standard, galvanized-steel 3” track system of configuration indicated designed for lift type indicated and clearances shown on Drawings, and complying with ASTM A 653/A 653M for minimum G60 (Z180) zinc coating. Provide complete track assembly including brackets, bracing, and reinforcement for rigid support of ball-bearing roller guides for required door type and size. Slot vertical sections of track spaced 2 inches apart for door-drop safety device. Slope tracks at proper angle from vertical or design tracks to ensure tight closure at jambs when door unit is closed. Slope tracks up the roof slope for maximum clearance.

B. Track Reinforcement and Supports: Galvanized-steel track reinforcement and support members, complying with ASTM A 36/A 36M and ASTM A 123/A 123M. Secure, reinforce, and support tracks as required for door size and weight to provide strength and rigidity without sag, sway, and vibration during opening and closing of doors.

1. Vertical Track Assembly: Track with continuous reinforcing angle attached to track and attached to wall with jamb brackets.
2. Sloped Track Assembly (Doors 14,15,16,17,18 & Add Alt. #21) (Slope track to match the roof slope): Track with continuous reinforcing angle attached to track and supported at points from curve in track to end of track by laterally braced attachments to overhead structural members.

3. High lift at door 12, 10’ x 12’ end door.

C. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.

D. Windows: Manufacturer's standard window units of type and size indicated and in arrangement shown. Set glazing in vinyl, rubber, or neoprene glazing channel for metal-framed doors and elastic glazing compound for wood doors, as required. Provide removable stops of same material as door-section frames.

2.3 HARDWARE

A. General: Provide heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.

B. Hinges: Heavy-duty, galvanized-steel hinges of not less than 0.079-inch- nominal coated thickness at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is not possible. Provide double-end hinges where required, for doors over 16 feet wide unless otherwise recommended by door manufacturer.

C. Rollers: Heavy-duty rollers with steel ball-bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3-inch- diameter roller tires for 3-inch- wide track and 2-inch-diameter roller tires for 2-inch- wide track.

D. Push/Pull Handles: For push-up or emergency-operated doors, provide galvanized-steel lifting handles on each side of door.

2.4 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with interior 3 button operation station.

B. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.5 COUNTERBALANCE MECHANISM

A. Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs fabricated from steel-spring wire complying with ASTM A 229/A 229M, mounted on torsion shaft made of steel tube or solid steel. Provide springs designed for number of operation cycles indicated.
B. Weight Counterbalance: Counterbalance mechanism consisting of filled pipe weights that move vertically in a galvanized-steel weight pipe. Connect pipe weights with cable to weight-cable drums mounted on torsion shaft made of steel tube or solid steel.

C. Cable Drums and Shaft for Doors: Cast-aluminum or gray-iron casting cable drums mounted on torsion shaft and grooved to receive door-lifting cables as door is raised. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of torsion shaft. Provide one additional midpoint bracket for shafts up to 16 feet long and two additional brackets at onethird points to support shafts more than 16 feet long unless closer spacing is recommended by door manufacturer.

D. Cables: Galvanized-steel lifting cables with cable safety factor of at least 7 to 1.

E. Cable Safety Device: Include a spring-loaded steel or spring-loaded bronze cam mounted to bottom door roller assembly on each side and designed to automatically stop door if either lifting cable breaks.

F. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.

G. Provide a spring bumper at each horizontal track to cushion door at end of opening operation.

H. hand chain with chain holder secured to operator guide.

2.6 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and "operation cycles" requirement specified, with electric motor and factory-rewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.
2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door-Operator Type: Unit consisting of electric motor, gears, pulleys, sprockets, chains, and controls needed to operate door and meet required usage classification.

1. Jackshaft, Side Mounted: Jackshaft operator mounted on the inside front wall on right or left side of door and connected to torsion shaft with an adjustable coupling or drive chain.

D. Electric Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 11005 "Common Motor Requirements for Equipment" unless otherwise indicated.

1. Electrical Characteristics:
b. Volts: Verify with building service.
c. Hertz: 60.

2. Motor Type and Controller: Reversible motor and controller (disconnect switch) for motor exposure indicated.

3. Motor Size: Minimum size as indicated. Large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.

4. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.

5. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.

1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.

a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensor device. When self-monitoring feature is activated, door closes only with sustained pressure on close button.

G. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."

1. Interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.


I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

2.7 DOOR ASSEMBLY

A. Steel Sectional Door: Sectional door formed with hinged sections.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

B. Installed R-Value: 17.5.

C. Steel Sections: Zinc-coated (galvanized) steel sheet with G60 zinc coating.
   1. Section Thickness: 2 inches.
   2. Exterior-Face, Steel Sheet Thickness: .016 inches nominal coated thickness.
      a. Surface: Flat.
   3. Insulation: Foamed in place.
   4. Interior Facing Material: Zinc-coated (galvanized) steel sheet of manufacturer's recommended thickness to meet performance requirements nominal coated thickness.

D. Track Configuration: Follow roof slope on main doors and provide highlift at 10’ x 12’ end door.

E. Weatherseals: Fitted to bottom and top and around entire perimeter of door.

F. Windows: (See Elevations) Approximately 24 by 7 inches with curved corners and spaced apart the approximate distance as indicated on Drawings; in one row at height indicated on Drawings; installed with insulated glazing of the following type:
   1. Insulating Glass: Manufacturer's standard.

G. Roller-Tire Material: Manufacturer's standard.

H. Counterbalance Type: Manufacturer’s standard.

I. Electric Door Operator:
   1. Usage Classification: Heavy duty, 60 to 90 cycles per hour.
   2. Operator Type: Jackshaft, side mounted.

J. Door Finish:
   1. Baked-Enamel or Powder-Coated Finish: Color and gloss as selected by Architect from manufacturer's full range.
   2. Finish of Interior Facing Material: Match finish of exterior section face.

2.8 GENERAL FINISH REQUIREMENTS

A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
2.9 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Tracks:

1. Fasten vertical track assembly to opening jambs and framing, spaced not more than 24 inches apart.

2. Hang horizontal track assembly from structural overhead framing with angles or channel hangers attached to framing by welding or bolting, or both. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.

3. Repair galvanized coating on tracks according to ASTM A 780.

3.3 STARTUP SERVICES

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.
C. Adjust doors and seals to provide weathertight fit around entire perimeter.

D. Align and adjust motors, pulleys, belts, sprockets, chains, and controls according to manufacturer's written instructions.

E. Touch-up Painting: Immediately after welding galvanized materials, clean welds and abraded galvanized surfaces and repair galvanizing to comply with ASTM A 780.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain sectional doors.

END OF SECTION 08361
SECTION 08561 - VINYL WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes vinyl-framed windows.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review, discuss, and coordinate the interrelationship of vinyl windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealants, and protecting finishes.
3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for vinyl windows.

B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

C. Samples for Verification: For vinyl windows and components required, prepared on Samples of size indicated below:

1. Exposed Finishes: 2 by 4 inches.
2. Exposed Hardware: Full-size units.

D. Product Schedule: For vinyl windows. Use same designations indicated on Drawings.
1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating vinyl windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace vinyl windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Failure to meet performance requirements.
   b. Structural failures including excessive deflection, water leakage, and air infiltration.
   c. Faulty operation of movable sash and hardware.
   d. Deterioration of materials and finishes beyond normal weathering.
   e. Failure of insulating glass.

2. Warranty Period:
   a. Window: 10 years from date of Substantial Completion.
   b. Glazing Units: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. CertainTeed Corporation.
2. Crestline Windows and Doors; SNE Enterprises, Inc.
5. Kolbe & Kolbe Millwork Co., Inc.
7. Pella Corporation.
8. Thermal Windows, Inc.
9. Weather Shield Mfg., Inc.

B. Source Limitations: Obtain vinyl windows from single source from single manufacturer.
2.2 WINDOW PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/1.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Window Certification: WDMA certified with label attached to each window.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/1.S.2/A440 as follows:

1. Minimum Performance Class: R.

C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.30 Btu/sq. ft. x h x deg F.

D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.40.

2.3 VINYL WINDOWS

A. Operating Types: Provide the following operating types in locations indicated on Drawings:

1. Horizontal sliding.


1. Finish: Integral color, white.

C. Insulating-Glass Units: ASTM E 2190, certified through IGCC as complying with requirements of IGCC.

1. Glass: ASTM C 1036, Type 1, Class 1, q3.
   a. Tint: Clear.
2. Lites: Two.
3. Filling: Fill space between glass lites with argon.
4. Low-E Coating: Pyrolytic on second surface,

D. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

E. Horizontal-Sliding Window Hardware:

1. Sill Cap/Track: Manufacturer’s standard of dimensions and profile indicated; designed to comply with performance requirements indicated and to drain to the exterior.
2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only. Provide custodial locks.
3. Roller Assemblies: Low-friction design.
F. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

G. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
   1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 INSECT SCREENS

A. General: Fabricate insect screens to fully integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.
   1. Type and Location: Half, outside for sliding sashes.

B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
   1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.

C. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch diameter, coated aluminum wire.

2.5 FABRICATION

A. Fabricate vinyl windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Glaze vinyl windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. Mullions: Provide mullions and cover plates, compatible with window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units. Provide manufacturer's standard finish to match window units.

E. Hardware: Mount hardware through double walls of vinyl extrusions or provide corrosion-resistant reinforcement.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.

B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.

B. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.

1. Keep protective films and coverings in place until final cleaning.

C. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 08561
SECTION 08710 - DOOR HARDWARE

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Section includes:
      1. Mechanical door hardware for the following:
         a. Swinging doors.
      2. Cylinders for door hardware specified in other Sections.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
   B. Other Action Submittals:
      1. Door Hardware Schedule: Prepared by or under the supervision of an Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
         a. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
         b. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page.
         c. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
         d. Content: Include the following information:
            1) Identification number, location, hand, size, and material of each door and frame.
            2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.

4) Fastenings and other pertinent information.

5) Explanation of abbreviations, symbols, and codes contained in schedule.

6) Mounting locations for door hardware.

7) List of related door devices specified in other Sections for each door and frame.

2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and Architectural Hardware Consultant.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

1. Warehousing Facilities: In Project's vicinity.

2. Scheduling Responsibility: Preparation of door hardware and keying schedules.

B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as follows:

C. Source Limitations: Obtain each type of door hardware from a single manufacturer.

D. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

E. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.

2. Comply with the following maximum opening-force requirements:

   a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than ½ inch.
4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

F. Keying Conference: Conduct conference at Project site to comply with requirements in Section 01310 "Project Management and Coordination." In addition to Owner, Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Preliminary key system schematic diagram.
3. Requirements for key control system.
4. Address for delivery of keys.

G. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays. Inspect and discuss preparatory work performed by other trades.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

D. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.8 COORDINATION

A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including excessive deflection, cracking, or breakage.
   b. Faulty operation of doors and door hardware.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.
   a. Exit Devices: Two years from date of Substantial Completion.
   b. Manual Closers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Provide door hardware for each door as scheduled in Part 3 "Door Hardware Schedule" Article to comply with requirements in this Section.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.

2.2 KEYING


1. No Master Key System: Only change keys operate cylinder.
2. Master Key System: Change keys and a master key operate cylinders.
3. Grand Master Key System: Change keys, a master key, and a grand master key operate cylinders.
4. Great-Grand Master Key System: Change keys, a master key, a grand master key, and a great-grand master key operate cylinders.

2.3 KEY CONTROL SYSTEM

A. Key Control Cabinet: BHMA A156.5; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 50 percent of the number of locks.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. American Key Boxes and Cabinets.
   b. GE Security, Inc.
   c. HPC, Inc.
   d. Lund Equipment Co., Inc.
   e. MMF Industries.
   f. Tri Palm International.

B. Key Lock Boxes: Designed for storage of two keys, with tamper switches to connect to intrusion detection system.

   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

      a. GE Security, Inc.
      b. HPC, Inc.
      c. Knox Company.

2.4 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.

   1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.

C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

   1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2.5 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.

2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
   1. Replace construction cores with permanent cores as directed by Owner.
   2. Furnish permanent cores to Owner for installation.

E. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

F. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 07920 "Joint Sealants."

G. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

H. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

I. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

J. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
   1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
   1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door
hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DOOR HARDWARE SCHEDULE

All locks shall be Best, with Best Key Cylinder 7 Pin System. – No Substitutions
All locks shall be keyed as directed by ITD.
Best cores and keys for locks will be supplied by ITD.
All closers shall be LCN- No substitutions

**HW SET NO: 1**

DOOR NUMBER: (Includes but is not limited to the following doors)

15  16  17  18

<table>
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<th>HARDWARE</th>
<th>BY DOOR MFG</th>
<th>B/O</th>
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**HW SET NO: 2**

DOOR NUMBER: (Includes but is not limited to the following doors)

1  10  13  14

| 3 EA HINGE        | BB1279 4.5 X 4.5 NRP | 26D | HAG |
| 1 EA EXIT DEVICE | 2100 X AU           | 626 | YAL |
| 1 EA RIM CYLINDER| 1E72                | 626 | BES |
| 1 EA SURFACE CLOSER| 4040XP HEDA     | 689 | LCN |
| 1 EA KICK PLATE   | 194S 10 X 34       | 32D | HAG |
| 1 EA FLOOR STOP   | FS18S              | BLK | IVE |
| 1 SET SEALS       | 303AS              | AL  | PEM |
| 1 EA DOOR SHOE    | 210V               | AL  | PEM |
| 1 EA THRESHOLD    | 271A               | AL  | PEM |

**HW SET NO: 3**

DOOR NUMBER: (Includes but is not limited to the following doors)

3

<p>| 3 EA HINGE        | BB1279 4.5 X 4.5 NRP | 26D | HAG |
| 1 EA OFF/ENT LOCK | 93K7AB 15D S3       | 626 | BES |</p>
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**HW SET NO: 3.1**

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<td></td>
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<td>93K7AB 15D S3</td>
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<td>BES</td>
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<tr>
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<tr>
<td>1 EA</td>
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<td>IVE</td>
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<td>1 EA</td>
<td>DOOR BOTTOM</td>
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<td>1 EA</td>
<td>THRESHOLD</td>
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<td>1 EA</td>
<td>SURFACE CLOSER</td>
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<td>4040XP SCUSH</td>
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<td>1 EA</td>
<td>CUSH SHOE SUPPORT</td>
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<td>PRIVACY LATCH</td>
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<td>93K0L 15D S3</td>
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1 EA  KICK PLATE  194S 10 X 34  32D  HAG
1 EA  WALL STOP  WS401/402CVX  626  IVE
1 SET  SEALS  303AS  AL  PEM
1 EA  DOOR BOTTOM  315N  CLR  PEM
1 EA  THRESHOLD  271A

HW SET NO: 5
DOOR NUMBER: (Includes but is not limited to the following doors)
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<tr>
<td>2 EA MANUAL FLUSH BOLT</td>
<td>FB458</td>
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<td>IVE</td>
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<td>1 EA DUST PROOF STRIKE</td>
<td>DP1</td>
<td>626</td>
<td>IVE</td>
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<tr>
<td>1 EA PASSAGE LATCH</td>
<td>93K0N 15D S3</td>
<td>626</td>
<td>BES</td>
</tr>
<tr>
<td>2 EA WALL STOP</td>
<td>WS401/402CVX</td>
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<td>IVE</td>
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<tr>
<td>1 EA SECURITY ASTRAGAL</td>
<td>43SP</td>
<td>600</td>
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<td>1 EA CHAIN 14' (2 ROWS)</td>
<td>3/8&quot; X SWIVEL EYEBOLT SNAP ON ONE END</td>
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<td>626</td>
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<td>1 EA SURFACE CLOSER</td>
<td>4040XP EDA</td>
<td>689</td>
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<td>1 EA KICK PLATE</td>
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<td>1 EA WALL STOP</td>
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<tr>
<td>1 SET SEALS</td>
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<td>1 EA COORDINATOR</td>
<td>COR X FL</td>
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<td>2 EA MOUNTING BRACKET</td>
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<td>IVE</td>
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<td>1 EA CARRYBAR</td>
<td>CB1</td>
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END OF SECTION 08710
SECTION 08800 – GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY
A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Exterior doors.
   2. NOTE: Windows are factory-glazed.

1.3 DEFINITIONS
A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
C. Interspace: Space between lites of an insulating-glass unit.

1.4 SUBMITTALS
A. Product Data: For each glass product and glazing material.

1.5 QUALITY ASSURANCE
A. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

1.6 DELIVERY, STORAGE, AND HANDLING
A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
B. Comply with insulating-glass manufacturer’s written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

1. Minimum Glass Thickness for Door Lites: Not less than ¼ inch – tempered.

2.2 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

B. Insulated: At Exterior Doors: Provide 1” Low “E” Solarban 60, clear, using ¼” fully tempered.

2.3 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
2.4 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

3.4 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

D. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 08800
SECTION 09221 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Framing Industry Association or the Steel Stud Manufacturers Association.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

C. Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.

B. Studs and Tracks: ASTM C 645. Use either steel studs and tracks or embossed steel studs and tracks.
   1. Steel Studs and Tracks:
      a. Minimum Base-Metal Thickness: As indicated on Drawings.
      b. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where required, provide one of the following:
   1. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.
   1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:
   1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

3.3 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.


B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.

1. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.

   a. Install two studs at each jamb unless otherwise indicated.
   b. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

2. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

3. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

   a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

E. Direct Furring:

   1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION 09221
SECTION 09250 - GYPSUM BOARD

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Section Includes:
      1. Interior gypsum board.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE AND HANDLING
   A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS
   A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
   B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
   C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
      1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
      2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.
PART 2 - PRODUCTS

2.1 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

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. American Gypsum.
2. CertainTeed Corp.
3. Georgia-Pacific Gypsum LLC.
4. Lafarge North America Inc.
6. PABCO Gypsum.
7. Temple-Inland.
8. USG Corporation.

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch, Type X – typical.
2. Long Edges: Tapered.

C. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

2. Long Edges: Tapered.

2.3 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound. If required, insert joint treatment products designed for use with mold-resistant gypsum board products such as ProForm XP by National Gypsum Company or Rapid Set by CTS Cement Manufacturing.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim.
edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Ceiling Type: Ceiling surfaces – 5/8” Type X.
2. Wall Board Type: Vertical surfaces – 5/8” Type X.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
   a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application: (2 hour firewall)

1. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
2. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, beveled edges and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 5: On all walls and ceilings.

3.6 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09250
SECTION 09650 - RESILIENT FLOORING (Resilient Linoleum Sheet Flooring)

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Resilient linoleum sheet flooring.
   2. Cove material up wall for cove base.

1.02 SYSTEM DESCRIPTION

A. Performance Requirements: Provide flooring which has been manufactured, fabricated and installed to performance criteria certified by manufacturer without defects, damage, or failure.

1.03 SUBMITTALS

A. Product Data: Submit product data, including manufacturer's SPEC-DATA product sheet, for specified products.

B. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including anchorage, accessories, finish colors, patterns and textures.

C. Samples: Submit selection and verification samples for finishes, colors, and textures.

D. Closeout Submittals: Submit the following:
   1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.
   2. Warranty: Warranty documents specified herein.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
   1. Engage installer certified as a Manufacturers "Master Mechanic."

B. Regulatory Requirements:
   1. Fire Performance Characteristics: Provide resilient linoleum sheet flooring with the following fire performance characteristics as determined by testing products in accordance with ASTM method indicated below by a certified testing laboratory or another testing and inspecting agency acceptable to authorities having jurisdiction:
      a. Critical Radiant Flux: Class 1 Rating per NFPA 253 (ASTM 648) (0.45 watts/cm² or greater).
      b. Smoke Density: Less than 450 per NFPA 258 (ASTM E 662).

C. Mock-Ups: Install at project site a job mock-up using acceptable products and manufacturer approved installation methods. Obtain Owner's and Architect's acceptance of finish color, texture and pattern, and workmanship standard.
   1. Mock-Up Size: Select one room or area scheduled to be covered.
2. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispo of mock-up when no longer required or if approved installation the mock-up may remain as finished product.
3. Incorporation: Mock-up may be incorporated into final construction upon Owner's approval.

D. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

D. Storage and Protection: Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
   1. Material should be stored in areas that are fully enclosed, weathertight with the permanent HVAC system set at a uniform temperature of at least 68 degrees F for 72 hrs. prior to, during and after installation.

1.06 PROJECT CONDITIONS

A. Environmental Requirements/Conditions: In accordance with manufacturer's recommendations, Areas to receive flooring shall be clean, fully enclosed, weathertight with the permanent HVAC set at a uniform temperature of at least 68 degrees F. The flooring material should be conditioned in the same manner. Maximum temperature should not exceed 100 degrees F after installation.

B. Temperature Requirements: Maintain air temperature in spaces where products will be installed for time period before, during, and after installation as recommended by manufacturer.
   1. Temperature Conditions: 68 degrees F (20 degrees C) for 72 hours prior to, during and after installation.

C. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.07 SEQUENCING AND SCHEDULING

A. Finishing Operations: Install tile flooring after finishing operations, including painting and ceiling operations, have been completed.

B. Concrete Curing: Do not install tile flooring over concrete substrates until substrates have cured and are dry to bond with adhesive as determined by resilient flooring manufacturer's recommended bond, moisture test, and pH test.
1.08 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.
   1. Warranty Period: Five (5) year limited warranty commencing on Date of Substantial Completion.

1.9 MAINTENANCE

A. Extra Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels.
   1. Quantity: Furnish quantity of flooring units equal to 5% of amount installed.
   2. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra materials.

PART 2 PRODUCTS

2.01 RESILIENT LINOLEUM SHEET FLOORING

A. Manufacturer: Forbo Linoleum, Inc. or a pre-approved equal.

B. Proprietary Product(s): Marmoleum Real Linoleum Sheet and Linoleum Adhesive.
   1. Description: Homogeneous sheet linoleum of primarily natural materials consisting of linseed oil, wood flour, and rosin binders, mixed and calendered onto natural jute backing. Pattern and color shall extend throughout total thickness of material.
   2. Width: 79".
   3. Length: 89 Linear Feet.
   4. Gauge: 1/10”.
   5. Backing: Jute.
   6. Pattern and Color: As selected by Architect from manufacturer's standard patterns and colors.
   7. Adhesive: Forbo Linoleum, Inc., L910 Adhesive (US) or Forbo Linotack 414 (Canada).
   9. Topshield™ finish

2.02 RELATED MATERIALS

A. Related Materials: Refer to other sections for related materials as follows:
   1. Underlayment and Patching Compound: Manufacturer’s recommended product.
   2. Resilient Flooring Accessories: Provide resilient reducer strips at the flooring transitions.

2.03 SOURCE QUALITY

A. Source Quality: Obtain flooring product materials from a single manufacturer.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS
A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions.

B. Material Inspection: In accordance with manufacturer's installation requirements, visually inspect materials prior to installation. Material with visual defects shall not be installed and shall not be considered as a legitimate claim.

3.03 PREPARATION

A. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.

B. Surface Preparation:
   1. General: Prepare floor substrate in accordance with manufacturer's instructions.
   2. Floor Substrate: Prepare floor substrate to be smooth, rigid, flat, level, permanently dry, clean and free of foreign materials such as dust, paint, grease, oils, solvent, curing and hardening compounds, sealers, asphalt and old adhesive residue.

3.04 INSTALLATION

A. Adhesive Flooring Installation: Cut required length of linoleum flooring from roll. Layout and position sheet flooring so that any seams will fall at least 6 inches from underlayment joints or saw cuts in concrete substrate. Scribe and cut flooring material to shape of vertical surfaces, including walls and partitions. Apply adhesive and lay sheet flooring into wet adhesive and roll with a 100 pound roller. Install sheet flooring square with room axis.
   1. Adhesive, Seamless Flooring Installation: Rout out seams and heat weld together with complementary colored heat welding rod of complimentary composition in accordance with resilient flooring manufacturer's recommendations.
   2. Adhesive Material Installation: Use trowel as recommended by flooring manufacturer for specific adhesive. Spread at a rate of approximately 150 sq. ft./gal. as recommended by flooring manufacturer.

B. Installation Techniques:
   1. Scribe, cut, fit flooring to butt tightly to vertical surfaces, permanent fixtures and built-in furniture, including pipes, outlets, edgings, thresholds, nosings, and cabinets.
   2. Extend flooring into toe spaces, door reveals, closets, and similar openings.
   3. Install flooring on covers for telephone and electrical ducts, and similar items occurring within finish floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers.
   4. Do not install resilient flooring over expansion joints. Use expansion joint covers manufactured for use with resilient flooring. Refer to other specification sections for expansion joint covers.
   5. Adhere resilient flooring to substrate without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed installation.
      a. Use adhesive applied to substrate in compliance with flooring manufacturer’s recommendations, including those for trowel notching, adhesive mixing, and adhesive open and working times.
   6. Roll resilient flooring as required by resilient flooring manufacturer.
C. Finish Flooring Patterns: As selected by Architect.

### 3.05 FIELD QUALITY REQUIREMENTS

A. Manufacturer's Field Services: Provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.
   1. Site Visits: At start of project and minimum 1 visit during installation and a final inspection.

### 3.06 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.
   1. Remove visible adhesive and other surface blemishes using cleaning methods recommended by tile floor manufacturer.
   2. Sweep and vacuum floor after installation.
   3. Do not wash floor until after time period recommended by tile flooring manufacturer.
   4. Damp-mop tile flooring to remove black marks and soil.

### 3.07 PROTECTION

A. Protection: Protect installed product and finish surfaces from damage during construction. Remove and legally dispose of protective covering at time of Substantial Completion.

### 3.08 INITIAL MAINTENANCE PROCEDURES

A. General: Include in Contract Sum Amount cost for initial maintenance procedures, and execute procedures after flooring installation as recommended by flooring manufacturer.

B. Initial maintenance "Starter Kit" supplied by manufacturer. Initial maintenance to be conducted by flooring contractor.

END OF SECTION
SECTION 09653 - RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary
      Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY
   A. This Section includes the following:
      1. Wall base.

1.3 SUBMITTALS
   A. Product Data: For each type of product indicated.
   B. Samples for Initial Selection: For each type of product indicated.

1.4 QUALITY ASSURANCE
   A. Fire-Test-Response Characteristics: Provide resilient stair accessories with a critical radiant
      flux classification of Class I, not less than 0.45 W/sq. cm, as determined by testing identical
      products per ASTM E 648 by a testing and inspecting agency acceptable to authorities having
      jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Store resilient products and installation materials in dry spaces protected from the weather, with
      ambient temperatures maintained within range recommended by manufacturer, but not less than
      50 deg F or more than 90 deg F.

1.6 PROJECT CONDITIONS
   A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F
      or more than 95 deg F, in spaces to receive floor tile during the following time periods:
      1. 48 hours before, during and after installation.
   B. Install resilient products after other finishing operations, including painting, have been
      completed.
1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

   1. Furnish not less than 4 full tread and riser lengths and 10’ of stringer cover of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

2.2 COLORS AND PATTERNS

A. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.3 RESILIENT WALL BASE

A. Wall Base: ASTM F 1861.
   1. Johnsonite

B. Type (Material Requirement): TS (rubber, vulcanized thermoset).

C. Group (Manufacturing Method): I (solid, homogeneous) or II (layered)

D. Style: Cove (with top-set toe).

E. Minimum Thickness: 1/8 inch.

F. Height: 4 inches where indicated.

G. Lengths: Coils in manufacturer's standard length.

H. Outside Corners: Premolded.

I. Inside Corners: Premolded.

J. Surface: Smooth.

2.4 RESILIENT MOLDING ACCESSORY

A. Description: Joiner for each different flooring material.
   1. Johnsonite

B. Material: Rubber
2.5 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturers for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

   1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

      a. Cove Base Adhesives: 50 g/L.
      b. Rubber Floor Adhesives: 60 g/L.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.

   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

   2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

C. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

D. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

   1. Do not install resilient products until they are the same temperature as the space where they are to be installed.

E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.
3.3 RESILIENT WALL BASE INSTALLATION

A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

D. Do not stretch wall base during installation.

E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

   a. Do not wash surfaces until after time period recommended by manufacturer.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

1. Apply protective floor polish to stair accessory surfaces that are free from soil, visible adhesive, and surface blemishes if recommended in writing by manufacturer.

   a. Use commercially available product acceptable to manufacturer.
   b. Coordinate selection of floor polish with Owner's maintenance service.

2. Do not move heavy and sharp objects directly over stair accessories. Place plywood or hardboard panels over surfaces and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 09653
SECTION 09911 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following exterior substrates:

1. Steel, including but not limited to doors, frames, bollards and other items indicated.

B. Related Sections include the following:

1. Division 9 Section "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.4 QUALITY ASSURANCE

A. MPI Standards:
1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."

B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
   a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
   b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on benchmark samples.
   a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 1 new and full unopened gallon of each material and color applied.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include manufacturers that meet and have MP1 certification as specified.
   1. Sherwin Williams
   2. Others by pre-approval.

2.2 PAINT, GENERAL

A. Material Compatibility:
   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
   1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

E. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.
   1. Spray steel doors and frames.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
   1. Owner may engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
   2. Testing agency will perform tests for compliance of paint materials with product requirements.
   3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from
previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Steel Substrates: (Primer & 2 Finish Coats Minimum)

   
   c. Topcoat: Exterior alkyd enamel (Gloss Level 5).

END OF SECTION 09911
SECTION 09912 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Concrete (Sealer) is found in Specification Section 03300.
2. Concrete.
3. Steel.
5. Wood trim.
6. Plywood.

B. Related Sections include the following:
   1. Division 9 Section "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat indicated.

   1. Submit Samples on rigid backing, 8 inches square.
   2. Step coats on Samples to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

   1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
   2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
1.4 QUALITY ASSURANCE

A. MPI Standards:

1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."


B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
   a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
   b. Other Items: Architect will designate items or areas required.

2. Apply benchmark samples after permanent lighting and other environmental services have been activated.

3. Final approval of color selections will be based on benchmark samples.
   a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F. 

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
1  Quantity: Furnish an additional 1 new and full unopened gallon of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include manufacturers that meet and have MP1 certification as specified.

2.2 PAINT, GENERAL

A. Material Compatibility:
   1  Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2  For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer's full range.

2.3 LATEX PAINTS

A. See paint schedule for specific MPI system number required.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

   1  Concrete: 12 percent.
   2  Masonry (Clay and CMU): 12 percent.
   3  Wood: 15 percent.
   4  Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

F. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.

3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:

1 Mechanical Work:
   a. Uninsulated metal piping.
   b. Uninsulated plastic piping.
   c. Pipe hangers and supports.
   d. Tanks that do not have factory-applied final finishes.
   e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
   f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
   g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2 Electrical Work:
   a. Switchgear.
   b. Panelboards.
   c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1 Owner may engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2 Testing agency will perform tests for compliance with product requirements.
3 Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.
3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates (Floor):

1 High-Performance Architectural Latex System: MPI INT 4.2D (MPI 139).
   a. Prime Coat: Alkali resistant water based, MPI #3.
   c. Topcoat: High-performance architectural latex (MPI 139).

B. Gypsum Board Substrates: (Primer and 2 Finish Coats Minimum)

1 High-Performance Architectural Latex System: MPI INT 9.2B. (MPI 139 Gloss Level 3).
   c. Topcoat: High-performance architectural latex (Gloss Level 3).

C. Wood Substrates (Plywood & Trim): (Primer and 2 Finish Coats Minimum)

1 High-Performance Architectural Latex System:
   a. Prime Coat: Primer, latex for interior wood, MPI #39.
   c. Topcoat: Latex, interior, high performance architectural (Gloss Level 3), MPI #139.

D. Steel Substrates: (Primer and 2 Finish coats Minimum)

1 High-Performance Architectural Latex System:
a. Prime Coat: Primer, alkyd, quick dry, for metal MPI #76.


c. Topcoat: Latex, interior, high performance architectural, (Gloss Level 3), MPI #139.
SECTION 10434 - PANEL SIGNAGE

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Section Includes:
      1. Room-identification signs.

1.3 DEFINITIONS
   A. Accessible: In accordance with the accessibility standard.

1.4 COORDINATION
   A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.

1.5 ACTION SUBMITTALS
   A. Product Data: For each type of product.
   B. Shop Drawings: For panel signs.
      1. Include fabrication and installation details and attachments to other work.
      2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
      3. Show message list, typestyles, graphic elements including raised characters and Braille, and layout for each sign at least half size.
      4. Show locations of electrical service connections.
      5. Include diagrams for power, signal, and control wiring.
   C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
      1. Include representative Samples of available typestyles and graphic symbols.
   D. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
1. Room-Identification Signs: Full-size Sample.

E. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

1.6 QUALITY ASSURANCE
A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.7 FIELD CONDITIONS
A. Field Measurements: Verify locations of anchorage devices embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.8 WARRANTY
A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Deterioration of finishes beyond normal weathering.
   b. Deterioration of embedded graphic image.
   c. Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
A. Accessibility Standard: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for signs.

2.2 SIGNS
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. Ace Sign Systems, Inc.
2. Advance Corporation; Braille-Tac Division.
3. Allen Industries, Inc.
5. APCO Graphics, Inc.
6. ASE, Inc.
7. ASI Sign Systems, Inc.
8. Best Sign Systems Inc.
11. Diskey Sign Company.
12. Fossil Industries, Inc.
16. Poblocki Sign Company, LLC.
17. Seton Identification Products.
18. Supersine Company (The); Division of Stamp-Rite, Inc.
20. Vomar Products, Inc.

B. Room-Identification Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
1. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated over subsurface graphics to acrylic or phenolic backing sheet to produce composite sheet.
   a. Composite-Sheet Thickness: Manufacturer's standard for size of sign.
   c. Subsurface Graphics: Reverse halftone or dot-screen image.
   d. Color(s): As selected by Architect from manufacturer's full range.

   a. Edge Condition: As indicated.
   b. Corner Condition in Elevation: Rounded to radius indicated.

4. Text and Typeface: Accessible raised characters and Braille, Times Roman. Finish raised characters to contrast with background color, and finish Braille to match background color.

2.3 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
   1. Use concealed fasteners and anchors unless indicated to be exposed.

B. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.
2.4 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
5. Internally brace signs for stability and for securing fasteners.
6. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

2.5 GENERAL FINISH REQUIREMENTS

A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of signage work.

B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.

C. Verify that anchor inserts are correctly sized and located to accommodate signs.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.

2. Install signs so they do not protrude or obstruct according to the accessibility standard.

3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Room-Identification Signs and Other Accessible Signage: Install in locations on walls as indicated and according to accessibility standard.

C. Mounting Methods

1. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

3.3 ADJUSTING AND CLEANING

A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.

B. Remove temporary protective coverings and strippable films as signs are installed.

C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10434
SECTION 10801 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Section Includes:
      1. Public-use washroom accessories.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product indicated. Include the following:
      1. Construction details and dimensions.
      2. Anchoring and mounting requirements, including requirements for cutouts in other work
         and substrate preparation.
      3. Material and finish descriptions.
      4. Features that will be included for Project.
      5. Manufacturer's warranty.

1.4 INFORMATIONAL SUBMITTALS
   A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.6 QUALITY ASSURANCE
   A. Source Limitations: For products listed together in the same Part 2 articles, obtain products
      from single source from single manufacturer.

1.7 COORDINATION
   A. Coordinate accessory locations with other work to prevent interference with clearances required
      for access by people with disabilities, and for proper installation, adjustment, operation,
      cleaning, and servicing of accessories.
   B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent
      delaying the Work.
PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.

C. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

D. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

E. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

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. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.

B. Toilet Tissue (Roll) Dispenser:

2. Description: Multi-roll dispenser.

C. Towel Dispenser: ITD supply and install.

D. Liquid-Soap Dispenser: ITD supply and install.

E. Grab Bar:

1. Mounting: Flanges with concealed fasteners.
2. Material: Stainless steel, 0.05 inch thick.
   a. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
4. Configuration and Length: As indicated on Drawings.

F. Mirror Unit: (without shelf)

1. Frame: Stainless-steel angle, 0.05 inch thick.
   a. Corners: Manufacturer's standard.
   a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.  
   b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.  

3. Size: As indicated on Drawings.  

2.3 FABRICATION  
A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.  
B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.  

PART 3 - EXECUTION  

3.1 INSTALLATION  
A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.  
B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.  

3.2 ADJUSTING AND CLEANING  
A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.  
B. Remove temporary labels and protective coatings.  
C. Clean and polish exposed surfaces according to manufacturer's written recommendations.  

END OF SECTION 10801
SECTION 11000 – LUBRICATION SYSTEM

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Section includes general requirements for providing a complete and efficient lubrication system including all accessories customarily furnished parts shall conform to current engineering practices of the industry relative to design, strength, quality of materials and workmanship.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product indicated.
   B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1.4 INFORMATIONAL SUBMITTALS
   A. Product Data: For each piece of equipment dispensing units for the following:
      1. Chassis Lube
      2. Engine Oil
      3. Hydraulic Oil
      4. Gear Oil
      5. Air

PART 2 - PRODUCTS

2.1 GENERAL
   A. Comply with requirements in this Section for lubrication equipment used for servicing all types of construction equipment, pickups, light duty and heavy duty trucks.
   B. Manufacturer:
      1. Balcrank or pre-approved equal.
   C. Description:
1. Type – Five unit air-operated wall mounted system with lubricants being delivered through lines from central supply system.

2. Dispensing units shall include:
   a) Chassis Lube
   b) Engine Oil
   c) Hydraulic Oil
   d) Gear Oil
   e) Air

3. Requirement – Bidder shall furnish all information, part numbers and catalogs describing complete unit being furnished.

4. Warranty – One year parts and labor against defects and workmanship.

D. Lubrication Reels

1. Description – All reels shall be of quality design, spring retractable, and corrosion resistant. Unit shall be designed to enable removing each reel individually without disturbing adjacent reels. Each reel will include high quality hose and ball retraction stop.

2. Chassis Lube Reel – Shall be a Balcrank model 2111-003S or approved equal including 50 feet of ¼-inch 5,000 psi hose with a Balcrank model 3310-009 or approved equal control handle including swivel joint, pressure vent control, built-in booster, and 18-inch whip hose.

3. Engine Oil Reel – Shall be a Balcrank model 2111-011S or approved equal including 50 feet of ½-inch 3000 psi hose with a Balcrank model 3330-055 or approved equal metered totalizing control handle (registering in quarts) including swivel, 10-inch flex hose, non-drip nozzle, and product type indicator plate.

4. Hydraulic Oil Reel – Shall be a Balcrank model 2111-011S or approved equal including 50 feet of ½-inch 3000 psi hose with a Balcrank model 3330-055 or approved equal metered totalizing control handle (registering in gallons) including swivel, 10-inch flex hose, non-drip nozzle, and product type indicator plate.

5. Gear Oil Reel – Shall be a Balcrank model 2111-011S or approved equal including 50 feet of ½-inch 3000 psi hose with a Balcrank model 3330-055 or approved equal metered totalizing control handle (registering in pints) including swivel, rigid non-drip tip, and product type indicator plate.

6. Air Reel - Shall be a Balcrank model 2111-019S or approved equal with 50 feet of ½-inch 3000 psi hose.

E. Pumps

1. Description – Shall be air-operated and include an appropriately sized Balcrank or approved equal mall mounted 1 piece filter/air regulator with gauge, and a Balcrank
model 3241-002 or approved equal safety overrun valve for each pump. An appropriately sized Balcrank model or approved equal line lubricator shall be furnished in the main air service line.

2. Chassis Lube Pump – Shall be a Balcrank model 1151 or approved equal with a 45/50% ratio and a minimum of three pounds per minute rated capacity. It shall fit a 120-pound drum and include drum cover, pressure connection hose, follow plate, and all other items needed for complete installation.

3. Engine, Hydraulic, and Gear Oil Pumps – Shall be Balcrank Panther model 1130-021 or approved equal with a minimum 5:1 ratio and a minimum three gallon per minute rated capacity. The pumps shall fit 55 gallon drums with bung adapters and include air expellers in the pump to prevent pumping or registering air through meter.

F. Piping

1. Description – High-pressure steel seamless tubing.

2. Size – 5/8 inch OD x .083-inch wall thickness on all lines.

3. Line Mounting – Lines shall be mounted uniformly to wall with unistrut supports at eight foot intervals


PART 3 - EXECUTION

3.1 INSTALLATION

A. Install equipment level and plumb, according to manufacturer’s written instructions.

1. Make all connects to utilities.

B. Complete equipment assembly where field assembly is required.

C. Install equipment with access and maintenance clearances that comply with manufacturer’s written installation instructions.

3.2 CLEANING AND PROTECTING

A. After completing installation of equipment, repair damaged finishes.

B. Clean and adjust equipment as required to produce ready-for-use condition.

C. Protect equipment form damage during remainder of the construction period.
3.3 DEMONSTRATION

A. Train Owner’s maintenance personnel to adjust, operate and maintain lubrication equipment.

END OF SECTION 11000
SECTION 13125 - METAL BUILDING SYSTEMS

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Section Includes:
      1. Structural-steel framing.
      2. Metal roof panels.
      3. Metal wall panels and liner.
      4. Metal soffit panels.
      5. Thermal insulation.
      6. Accessories.

   B. Related Sections:
      1. Section 08331 "Overhead Coiling Doors."

1.3 DEFINITIONS
   A. Terminology Standard: See MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in referenced standards.

1.4 ACTION SUBMITTALS
   A. Product Data: For each type of metal building system component. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
      1. Structural-steel-framing system.
      2. Metal roof panels.
      3. Metal wall panels and liner.
      4. Insulation and vapor retarder facings (roof and wall).
      5. Flashing and trim.
      6. Accessories.
      7. Foundation.

   B. Shop Drawings: For the following metal building system components. Include plans, elevations, sections, details, and attachments to other work.
1. Anchor-Bolt Plans: Submit anchor-bolt plans and templates before foundation work begins. Include location, diameter, and projection of anchor bolts required to attach metal building to foundation. Indicate column reactions at each location.

2. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.

3. Metal Roof and Wall Panel Layout Drawings: Show layouts of metal panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.
   a. Show roof-mounted items including pipe penetrations.
   b. Show wall-mounted items including doors, windows and lighting fixtures.

4. Accessory Drawings: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:8):
   a. Flashing and trim.
   b. Roof cricket and braces.

C. Samples for Initial Selection: For units with factory-applied color finish.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of sizes indicated below:
   1. Metal Panels: Nominal 12 inches long by actual panel width. Include fasteners, closures, and other exposed panel accessories.
   2. Flashing and Trim: Nominal 12 inches long. Include fasteners and other exposed accessories.
   3. Vapor-Retarder Facings: Nominal 6-inch- square Samples.
   4. Accessories: Nominal 12-inch- long Samples for each type of accessory.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified erector manufacturer and professional engineer.

B. Welding certificates.

C. Metal Building System Certificates: For each type of metal building system, from manufacturer.
   1. Letter of Design Certification: Signed and sealed by a qualified professional engineer licensed in Idaho. Include the following:
      a. Name and location of Project.
      b. Order number.
      c. Name of manufacturer.
      d. Name of Contractor.
      e. Building dimensions including width, length, height, and roof slope.
f. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.

g. Governing building code and year of edition.

h. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).

i. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.

j. Building-Use Category: Indicate category of building use and its effect on load importance factors.

D. Erector Certificates: For each product, from manufacturer.

E. Manufacturer Certificates: For each product, from manufacturer.

F. Material Test Reports: For each of the following products:

1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shop primers.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for insulation and vapor-retarder facings. Include reports for thermal resistance, fire-test-response characteristics, water-vapor transmission, and water absorption.

H. Source quality-control reports.

I. Field quality-control reports.

J. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panel finishes to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer.

1. AISC Certification for Category MB: An AISC-Certified Manufacturer that designs and produces metal building systems and components in an AISC-Certified Facility.

2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified Idaho professional engineer.

B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.
C. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

D. Source Limitations: Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.

E. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

F. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings," for design requirements and allowable stresses.

G. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.

H. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to metal building systems including, but not limited to, the following:
   a. Condition of foundations and other preparatory work performed by other trades.
   b. Structural load limitations.
   c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.
   d. Required tests, inspections, and certifications.
   e. Unfavorable weather and forecasted weather conditions.

2. Review methods and procedures related to metal roof panel assemblies including, but not limited to, the following:
   a. Compliance with requirements for purlin and rafter conditions, including flatness and attachment to structural members.
   b. Structural limitations of purlins and rafters during and after roofing.
   c. Flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
   d. Temporary protection requirements for metal roof panel assembly during and after installation.
   e. Roof observation and repair after metal roof panel installation.

3. Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:
   a. Compliance with requirements for support conditions, including alignment between and attachment to structural members.
   b. Structural limitations of girts and columns during and after wall panel installation.
   c. Flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
   d. Temporary protection requirements for metal wall panel assembly during and after installation.
   e. Wall observation and repair after metal wall panel installation.
1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Protect foam-plastic insulation as follows:
   1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
   2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
   3. Complete installation and concealment of foam-plastic materials as rapidly as possible in each area of construction.

1.9 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements:
   1. Established Dimensions for Foundations: Comply with established dimensions on approved anchor-bolt plans, establishing foundation dimensions and proceeding with fabricating structural framing without field measurements. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions.
   2. Established Dimensions for Metal Panels: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal panels without field measurements, or allow for field trimming metal panels. Coordinate construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.10 COORDINATION

A. Coordinate sizes and locations of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Section 03300 "Cast-in-Place Concrete."

B. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.
1.11 WARRANTY

A. Special Warranty on Metal Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. R & M Steel Buildings, 20595 Farmway Road, Caldwell, Idaho.
2. Varco Pruden
3. American Steel Buildings

2.2 METAL BUILDING SYSTEMS

A. Description: Provide a complete, integrated set of metal building system manufacturer's standard mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.

1. Provide metal building system of size and with bay spacings, roof slopes, and spans indicated.

B. Primary-Frame Type:

1. Rigid Clear Span: Solid-member, structural-framing system without interior columns.

C. End-Wall Framing: Manufacturer's standard, for buildings not required to be expandable.

D. Secondary-Frame Type: Manufacturer's standard purlins and joists and exterior-framed (bypass) girts.
E. Eave Height: As indicated by nominal height on Drawings.

F. Bay Spacing: As indicated on drawings.

G. Roof Slope: As indicated on drawings.

H. Roof System: See Section 2.5 Metal Roof Panel for concealed fastener, vertical-rib, standing-seam metal roof panels with field-installed insulation.

I. Exterior Wall System: Manufacturer's standard exposed-fastener metal wall panels with field-installed insulation.

2.3 METAL BUILDING SYSTEM PERFORMANCE

A. Delegated Design: Design metal building system, including comprehensive engineering analysis by a qualified Idaho professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."

1. Design Loads: As indicated on Drawings.

2. Deflection Limits: Design metal building system assemblies to withstand design loads with deflections no greater than the following:

   b. Girts: Horizontal deflection of 1/180 of the span.
   c. Metal Roof Panels: Vertical deflection of 1/180 of the span.
   d. Metal Wall Panels: Horizontal deflection of 1/180 of the span.
   e. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.

3. Drift Limits: Engineer building structure to withstand design loads with drift limits no greater than the following:

   a. Lateral Drift: Maximum of 1/200 of the building height.

4. Metal panel assemblies shall withstand the effects of gravity loads and loads and stresses within limits and under conditions indicated according to ASTM E 1592.

C. Seismic Performance: Metal building systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

D. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

   1. Temperature Change (Range): 120 deg F, ambient 180 deg F, material surfaces.
E. Air Infiltration for Metal Wall Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of wall area when tested according to ASTM E 283 at static-air-pressure difference of 1.57 lb/sq. ft.

F. Water Penetration for Metal Wall Panels: No water penetration.

G. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for Class 90.

H. Thermal Performance: Provide insulated metal panel assemblies with the following maximum U-factors and minimum R-values for opaque elements when tested according to ASTM C 1363 or ASTM C 518:

1. Metal Roof Panel Assemblies:
   a. R-Value: 50 minimum.

2. Metal Wall Panel Assemblies:
   a. R-Value: 20 minimum.

I. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.

2.4 STRUCTURAL-STEEL FRAMING

A. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafter, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.


   a. Slight variations in span and spacing may be acceptable if necessary to comply with manufacturer's standard, as approved by Architect.

2. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.


4. Exterior Column Type: Uniform depth or tapered.

5. Rafter Type: Uniform depth or tapered.

B. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:

1. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet.

C. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either
cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prepainted with coil coating, to comply with the following:

1. **Purlins:** C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; minimum 2-1/2-inch-wide flanges.
   
   a. **Depth:** As needed to comply with system performance requirements.

2. **Girts:** C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 40 to 50 degrees from flange, with minimum 2-1/2-inch- (64-mm-) wide flanges.
   
   a. **Depth:** As required to comply with system performance requirements.

3. **Eave Struts:** Unequal-flange, C-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; to provide adequate backup for metal panels.

4. **Flange Bracing:** Minimum 2-by-2-by-1/8-inch structural-steel angles or 1-inch diameter, cold-formed structural tubing to stiffen primary-frame flanges.

5. **Sag Bracing:** Minimum 1-by-1-by-1/8-inch structural-steel angles.

6. **Base or Sill Angles:** Minimum 3-by-2-inch zinc-coated (galvanized) steel sheet.

7. **Purlin and Girt Clips:** Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.

8. **Secondary End-Wall Framing:** Manufacturer's standard sections fabricated from structural-steel sheet.

9. **Framing for Openings:** Channel shapes; fabricated from cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings and head, jamb, and sill of other openings.

10. **Miscellaneous Structural Members:** Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.

D. **Bracing:** Provide adjustable wind bracing as follows:

1. **Rods:** ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 (345); or ASTM A 529/A 529M, Grade 50 (345); minimum 1/2-inch- diameter steel; threaded full length or threaded a minimum of 6 inches at each end.

2. **Rigid Portal Frames:** Fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.

3. **Bracing:** Provide wind bracing using any method specified above, at manufacturer's option.

E. **Bolts:** Provide plain-finish bolts for structural-framing components that are primed or finish painted. Provide hot-dip galvanized bolts for structural-framing components that are galvanized.

F. **Materials:**

1. **W-Shapes:** ASTM A 992/A 992M; ASTM A 572/A 572M, Grade 50 or 55 (345 or 380); or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).

2. **Channels, Angles, M-Shapes, and S-Shapes:** ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55 (345 or 380); or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).
3. Plate and Bar: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55 (345 or 380); or ASTM A 529/A 529M, Grade 50 or 55 (345 or 380).
4. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
5. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or C, structural tubing.
6. Structural-Steel Sheet: Hot-rolled, ASTM A 1011/A 1011M, Structural Steel (SS), Grades 30 through 55 (205 through 380), or High-Strength Low-Alloy Steel (HSLAS), Grades 45 through 70 (310 through 480); or cold-rolled, ASTM A 1008/A 1008M, Structural Steel (SS), Grades 25 through 80 (170 through 550), or High-Strength Low-Alloy Steel (HSLAS), Grades 45 through 70 (310 through 480).
7. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
   a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grades 33 through 80 (230 through 550), or High-Strength Low-Alloy Steel (HSLAS), Grades 50 through 80 (340 through 550); with G90 (Z275) coating designation.
   b. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Structural Steel (SS), Grade 50 or 80 (340 or 550); with Class AZ50 (AZM150) coating.
   a. Finish: Plain.
9. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.
   a. Finish: Plain.
10. High-Strength Bolts, Nuts, and Washers: ASTM A 490 (ASTM A 490M), Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with spline ends; ASTM A 563 (ASTM A 563M) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers, plain.
11. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex-head steel structural bolts with spline ends.
   a. Finish: Plain.
   e. Finish: Plain.
e. Finish: Plain.

14. Threaded Rods: ASTM A 36/A 36M.
   c. Finish: Plain.

G. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.
   1. Apply primer to primary and secondary framing to a minimum dry film thickness of 1 mil (0.025 mm).
      a. Prime secondary framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil (0.013 mm) on each side.
   2. Prime galvanized members with specified primer after phosphoric acid pretreatment.
   3. Primer: SSPC-Paint 15, Type I, red oxide.

2.5 METAL ROOF PANELS

A. Vertical-Rib, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels. Roof panels shall be 2” high rib, mechanically double-folded with factory applied inseam sealant.
      b. Color: As selected by Architect from manufacturer's full range.
   2. Clips: Manufacturer's standard, floating type to accommodate thermal movement; fabricated from zinc-coated (galvanized) steel or aluminum-zinc alloy-coated steel, sheet.
   3. Joint Type: Mechanically seamed, double folded.
   5. Panel Height: 2 inches.
   7. Inseam sealant.
   8. Double-folded rib.

2.6 METAL WALL PANELS

A. Tapered-Rib-Profile, Exposed-Fastener Metal Wall Panels: Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs; designed
to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.

1. Material: Zinc-coated (galvanized) steel sheet, 26 gauge.
   b. Color: As selected by Architect from manufacturer's full range.

2. Major-Rib Spacing: 12 inches.
4. Panel Height: 1.125 inches.

B. Finishes:

1. Exposed Coil-Coated Finish:
   a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

C. Flush-Profile, Metal Liner Panel: Solid panels formed with vertical panel edges and intermediate stiffening ribs symmetrically spaced between panel edges; with flush joint between panels; designed for interior side of metal wall panel assemblies and installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant in side laps.

1. Material: Zinc-coated (galvanized), 0.028-inch nominal thickness.

2. Panel Coverage: 12 inches.
3. Panel Height: 1.5 inches.

2.7 THERMAL INSULATION AND VAPOR BARRIER (ROOF)

A. Energy Saver FP System by GBP Silvercote, Solon, Ohio, or approved equal, with an insulation R-value of 38 and an installed thickness of 10” in first layer and 3” minimum in second layer. Roof system shall be double layer system. Care should be taken to completely fill the purlin cavity to avoid condensation. In the event that there is no insulation positioned between the roof sheet and the purlin, a foam thermal break (1/8” x 3”) tape, or a thermal block (1” x 3” extruded polystyrene) shall be applied.

1. Vapor-Retarder and Facing:
2.8 THERMAL INSULATION (WALL)

A. Unfaced Metal Building Insulation: ASTM C 991, Type I, or NAIMA 202, glass-fiber-blanket insulation; 0.5-lb/cu. ft. (8-kg/cu. m) density; 2-inch wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less. R value exterior wall R-25 minimum.

1. Vapor-Retarder Facing: ASTM C 1136, with permeance not greater than 0.02 perm (1.15 ng/Pa x s x sq. m) when tested according to ASTM E 96/E 96M, Desiccant Method.

B. Thermal Spacer Insulation:
1. Thermal barrier insulation for steel frame walls and roof shall be ¼” Low-E insulation with an “R” value of 7.75 as manufactured by Environmentally Safe Products, Inc. Insulation to be cut in strips 2” wider than the width of the girts and purlins and placed continuously between the girts and purlins and exterior metal siding and roofing using two sided tape or approved equal by building manufacturer.

2.9 DOORS AND FRAMES

A. Swinging Personnel Doors and Frames: As specified in Section 08110 "Steel Doors and Frames."

2.10 ACCESSORIES

A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.

1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fascia, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
2. Clips: Manufacturer's standard, formed from steel sheet, designed to withstand negative-load requirements.
3. Cleats: Manufacturer's standard, mechanically seamed cleats formed from steel sheet.
4. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
5. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch (25-mm-) thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
6. Thermal Spacer Blocks: Where metal panels attach directly to purlins, provide thermal spacer blocks of thickness required to provide 1-inch (25-mm) standoff; fabricated from extruded polystyrene.

C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fascia, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same material as metal wall panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch (25-mm-) thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

D. Flashing and Trim: Formed from 0.022-inch (0.56-mm) nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match adjacent metal panels.

1. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.

2. Opening Trim: Formed from 0.022-inch nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Trim head and jamb of door openings, and head, jamb, and sill of other openings.

E. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.

F. Materials:

1. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.
   a. Fasteners for Metal Roof Panels: Self-drilling, Type 410 stainless-steel or self-tapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head, with EPDM washer under heads of fasteners bearing on weather side of metal panels.
   b. Fasteners for Metal Wall Panels: Self-drilling, Type 410 stainless-steel or self-tapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head, with EPDM sealing washers bearing on weather side of metal panels.
   c. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
   d. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

2. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

3. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

4. Metal Panel Sealants:
   b. Joint Sealant: ASTM C 920; one-part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.
2.11 SOURCE QUALITY CONTROL

A. Testing Agency: Owner may engage a qualified testing agency to evaluate product.

B. Special Inspector: Owner will engage a qualified special inspector to perform the following tests and inspections and to submit reports. Special inspector will verify that manufacturer maintains detailed fabrication and quality-control procedures and will review the completeness and adequacy of those procedures to perform the Work.

1. Special inspections will not be required if fabrication is performed by manufacturer registered and approved by authorities having jurisdiction to perform such Work without special inspection.

   a. After fabrication, submit copy of certificate of compliance to authorities having jurisdiction, certifying that Work was performed according to Contract requirements.

C. Testing: Test and inspect shop connections for metal buildings according to the following:

   1. Bolted Connections: Shop-bolted connections shall be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

   2. Welded Connections: In addition to visual inspection, shop-welded connections shall be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at inspector's option:

      a. Liquid Penetrant Inspection: ASTM E 165.
      b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
      c. Ultrasonic Inspection: ASTM E 164.
      d. Radiographic Inspection: ASTM E 94.

D. Product will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

2.12 FABRICATION

A. General: Design components and field connections required for erection to permit easy assembly.

   1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.

   2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.

C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.

1. Make shop connections by welding or by using high-strength bolts.
2. Join flanges to webs of built-up members by a continuous, submerged arc-welding process.
3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
4. Weld clips to frames for attaching secondary framing.
5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.

D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll-forming or break-forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.

1. Make shop connections by welding or by using non-high-strength bolts.
2. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary framing with specified primer after fabrication.

E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.

C. Proceed with erection only after unsatisfactory conditions have been corrected.
3.2 PREPARATION

A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.

B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION OF STRUCTURAL FRAMING

A. Erect metal building system according to manufacturer's written erection instructions and erection drawings.

B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.

C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.


1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.

F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.

1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for bolt type and joint type specified.

a. Joint Type: Snug tightened or pretensioned.
G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.

1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
2. Locate and space wall girts to suit openings such as doors and windows.
3. Locate canopy framing as indicated.
4. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.

H. Steel Joists: Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders," joist manufacturer's written instructions, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
4. Bolt joists to supporting steel framework using carbon-steel bolts unless otherwise indicated.
6. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

I. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.

1. Tighten rod and cable bracing to avoid sag.
2. Locate interior end-bay bracing only where indicated.

J. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.

K. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.4 METAL PANEL INSTALLATION, GENERAL

A. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.

1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.

B. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.

   a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.

2. Install metal panels perpendicular to structural supports unless otherwise indicated.
3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Locate metal panel splices over, but not attached to, structural supports with end laps in alignment.
6. Lap metal flashing over metal panels to allow moisture to run over and off the material.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.

1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Section 07920 "Joint Sealants."

3.5 METAL ROOF PANEL INSTALLATION

A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.

1. Install ridge caps as metal roof panel work proceeds.
2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.

B. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.

1. Install clips to supports with self-drilling or self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
4. Rigidly fasten eave end of metal roof panels and allow ridge end free movement due to thermal expansion and contraction. Predrill panels for fasteners.
5. Provide metal closures at peaks, rake edges, rake walls and each side of ridge caps.

C. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

D. Metal Roof Panel Installation Tolerances: Shim and align metal roof panels within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
2. Shim or otherwise plumb substrates receiving metal wall panels.
3. When two rows of metal panels are required, lap panels 4 inches (102 mm) minimum.
4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
5. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
6. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
8. Install flashing and trim as metal wall panel work proceeds.
9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated; or, if not indicated, as necessary for waterproofing.
10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.

C. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet nonaccumulative, on level, plumb, and on location lines as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 THERMAL INSULATION INSTALLATION

A. General: Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.

1. Set vapor-retarder-faced units with vapor retarder toward warm side of construction unless otherwise indicated. Do not obstruct ventilation spaces except for firestopping.
2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to the surrounding construction to ensure airtight installation.
3. Install factory-laminated, vapor-retarder-faced blankets straight and true in one-piece lengths, with both sets of facing tabs sealed, to provide a complete vapor retarder.
4. Install blankets straight and true in one-piece lengths. Install vapor retarder over insulation, with both sets of facing tabs sealed, to provide a complete vapor retarder.

B. Blanket Roof Insulation: Comply with the following installation method:

1. Two-Layers-between-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Install layer of filler insulation over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and crossbands below insulation.
   a. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.

2. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

C. Blanket Wall Insulation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal wall panels fastened to secondary framing.

1. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

3.8 DOOR AND FRAME INSTALLATION

A. General: Install doors and frames plumb, rigid, properly aligned, and securely fastened in place according to manufacturers' written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each door frame with elastomeric sealant used for metal wall panels.

B. Personnel Doors and Frames: Install doors and frames according to SDI A250.8. Fit non-fire-rated doors accurately in their respective frames, with the following clearances:

1. Between Doors and Frames at Jambs and Head: 1/8 inch
2. Between Edges of Pairs of Doors: 1/8 inch
3. At Door Sills with Threshold: 3/8 inch
4. At Door Sills without Threshold: 3/4 inch
5. At fire-rated openings, install frames according to, and doors with clearances specified in, NFPA 80.

C. Field Glazing: Comply with installation requirements in Section 08800 "Glazing."
3.9 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.

2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

C. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

3.10 FIELD QUALITY CONTROL

A. Special Inspections: Owner may engage a qualified special inspector to perform the following special inspections:

1. Inspection of fabricators.

2. Steel construction.

B. Tests and Inspections:

1. High-Strength, Field-Bolted Connections: Connections shall be inspected during installation according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
2. Welded Connections: In addition to visual inspection, field-welded connections shall be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at inspector's option:
   a. Liquid Penetrant Inspection: ASTM E 165.
   b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
   c. Ultrasonic Inspection: ASTM E 164.
   d. Radiographic Inspection: ASTM E 94.

C. Product will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.11 ADJUSTING
A. Doors: After completing installation, test and adjust doors to operate easily, free of warp, twist, or distortion.
B. Door Hardware: Adjust and check each operating item of door hardware and each door to ensure proper operation and function of every unit. Replace units that cannot be adjusted to operate as intended.

3.12 CLEANING AND PROTECTION
A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
C. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing, bearing plates, and accessories.
   1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or by SSPC-SP 3, "Power Tool Cleaning."
   2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
D. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
   1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
E. Doors and Frames: Immediately after installation, sand rusted or damaged areas of prime coat until smooth and apply touchup of compatible air-drying primer.
1. Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 13125
SECTION 14000 – BRIDGE CRANE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes furnishing and installing hand operated Bridge Crane.

1.3 ACTION SUBMITTALS

A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information.

B. Shop Drawings: Crane structure shall be designed by an Idaho Registered Structural Engineer. Stamped and signed drawings are required for Owner review.

1.  Include plans, elevations, sections, and large-scale details, coordination with building structure, relationships with other construction, and locations of equipment.

2.  Indicate maximum dynamic and static loads imposed on building structure at points of support.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Structural Engineer. Proof of Idaho Registration.

B. Crane Engineer resume: Showing 5 similar crane installations in the past 5 years.

C. Sample Warranty: For special warranty – Minimum 1 year.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For crane to include in operation, and maintenance manuals.

1. Include diagnostic, repair, and preventive maintenance information available to manufacturer's and Installer's maintenance personnel.
1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials, components, and equipment to jobsite as coordinated by General Contractor. General Contractor to store materials, components, and equipment off of ground, under cover, and in a dry location.

1.7 COORDINATION

A. General Contractor will coordinate installation of crane with steel building framing. Crane Supplier will furnish equipment with integral anchors, and deliver to Project site in time for installation.

B. General Contractor will coordinate locations and dimensions of other work relating to the crane.

1.8 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace crane that fails in materials or workmanship within specified warranty period.

1. Warranty Period: (1) One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Hoist and Trolley C.M. Lodestar.

1. 3 ton -240 volt, single phase, 1 HP Hoist lug mounted to low headroom geared trolley with load and travel limits, power cord and travel cable with push button control located at 2’6” off of finished floor elevation. Hoist shall have a minimum clear lift of 11’-6” from floor level and a lower limit of 6” from floor level. Hoist shall have a friction clutch, dual braking system and heavy duty magnetic and regenerative.

2. Include a metal chain container.

B. C.M. End trucks to be hand geared.

C. Electrical Conductor festooning systems for across bridge and along runway length.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine building structure, with crane installer present, for compliance with requirements for installation clearances and other conditions affecting performance of the Work. Verify critical
dimensions; and examine supporting structure and other conditions under which crane work is to be installed.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer’s written instructions.

B. The crane bridge beam shall be a continuous straight, selected member. Bridge beam shall be assembled per manufacturer’s recommendations. End stops will be installed at each end of the crane bridge beam and runway beams on both sides. The crane maximum capacity shall be plainly marked using 4 inch minimum high numbers and letters on both sides of the lifting beam and the load block. The marking shall be clearly legible from the floor level.

C. Unfinished steel parts of the crane assembly shall be given one shop coat of red lead or zinc chromate paint after assembly and one coat of compatible machinery gray enamel after erecting the building.

D. Electrician shall furnish & mount building disconnect switch within view adjacent to the bridge crane at a height of 5 feet.

E. All equipment and installation shall be in accordance with ANSI Standards B30.2 and OSHA Standards 1910.179.

F. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.

G. Alignment: Coordinate installation of crane with installation of other structure for accurate alignment.

H. Leveling Tolerance: Per manufacturer’s requirements.

I. Building heaters shall be located so they do not damage crane moving components or crane conductor & controls.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of crane installation and before permitting crane use, perform OSHA Load Test with Owner present. Apply lifting loads & check for smooth operation at 125% of rated capacity.

END OF SECTION 14000
SECTION 15010 - GENERAL MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

B. Related Sections: Refer to "Electrical Requirements for Mechanical Equipment" Section 15030 in Division 15 for basic electrical requirements for all mechanical equipment. Special and specific electrical requirements are specified within each respective equipment specification section.

1.2 SCOPE OF WORK - GENERAL

A. This section specifies the basic requirements for mechanical installations and includes requirements common to more than one section of Division 15. It expands and supplements the requirements specified in sections of Division 1.

B. The work covered by the Mechanical Sections of the Specifications shall include the furnishing of all materials, labor, transportation, tools, permits, fees, inspections, utilities and incidentals necessary for the complete installation of all mechanical work required in the Contract Drawings.

C. It is the intent of the Contract Documents to provide an installation complete in every respect. In the event that additional details or special construction is required for work indicated or specified under this section of work or work specified in other sections, it shall be the responsibility of the Contractor to provide all material and equipment which is usually furnished with such systems in order to complete the installation, whether mentioned or not.

D. The Contractor shall review all Contract Drawings and Specifications and include in his bid any work specifically as being performed in the mechanical section. The Contractor shall be responsible for all work performed by his subcontractors.

1.3 DEFINITIONS

A. "Provide" shall mean "furnish and install complete and ready for intended use."

B. "Indicated" shall mean "indicated on drawings".

C. "Concealed" shall mean "hidden from sight as in trenches, chases, furred spaces or hung ceilings."

D. "Exposed" shall mean "not concealed", as defined above.

E. "Noted" shall mean "noted on drawings or in specifications".
F. "Contractor" also referred to as "this Contractor" or "the Contractor", shall mean "the Mechanical Contractor".

1.4 CODES AND STANDARDS

A. All mechanical work shall be in strict accordance with the most current edition of the International Building Code (IBC), International Mechanical Code (IMC), Uniform Plumbing Code (UPC), National Fire Protection Association (NFPA), International Fire Code (IFC), National Electrical Code (NEC), Energy Code IECC and ASHRAE-90.1, and all applicable state and local codes, laws and ordinances.

1.5 PERMITS AND FEES

A. The Contractor shall obtain and pay for all required permits and fees necessary to fully complete all work included in the Contract Drawings and Specifications.

1.6 CONSTRUCTION OBSERVATIONS:

A. During the course of construction of this project, the engineer shall visit the project site periodically on an as-needed basis. The construction observation intervals may vary depending on the progress and/or stage of construction and whether piping and/or ductwork, etc., is being placed below grade and/or concealed, surface mounted items, setting of equipment, equipment connections, etc. However, written field questions are encouraged and welcomed throughout the course of construction and shall be answered promptly in writing, to keep the project construction on schedule. The project foreman should have the building plans, construction schedules, etc., affixed in mind, so the mechanical systems being assembled, the setting of equipment, of parts and pieces, related to the project are anticipated, to prevent delays or emergencies.

B. The engineer shall make one (1) final inspection. The contractor shall notify the engineer that the installation is complete, i.e., the systems are operating and have been tested and balanced, and everything is complete and operational, all equipment connections have been made and the owner’s representatives have been trained. At this time the engineer, the contractor, and the owner’s representative shall schedule a time to walk the project for evaluation, and record in writing the items found to be incomplete. The contractor shall make the corrections within one (1) week after this inspection.

C. On extra visits, the contractor shall report to the engineer that all systems are complete, and the project is ready for the owner’s acceptance.

1.7 INTENT AND INTERPRETATION

A. The Drawings and Specifications are intended to supplement each other and any details contained in one and not the other shall be included as if contained in both. Items not specifically mentioned in the specifications or noted on the drawings, but which are obviously necessary to make a complete working installation shall be included.

B. The drawings are partly diagrammatic and do not necessarily show the exact location of all new piping and existing utilities, unless specifically dimensioned.
C. Riser and other diagrams are schematic only and do not necessarily show the physical arrangement of the equipment. They shall not be used for obtaining quantities or lineal runs of piping.

D. All grilles, fixtures or other pieces of equipment shall be centered on windows, wall spaces, or other items, unless specifically dimensioned otherwise.

E. The location of the piping and ductwork shall be checked to determine that it clears all openings and structural members; that it may be properly concealed; and that it clears cabinets, lights and equipment having fixed locations.

F. Mechanical drawings shall serve as the working drawings for this portion of the work but the Contractor shall refer to the Architectural, Structural and Electrical drawings for additional detail affecting the installation of his work. Architectural drawings shall take precedence over the Mechanical drawings if any dimensional discrepancies exist.

G. The approximate location of each item is indicated on the drawings. These drawings are not intended to give complete and exact details in regard to location. Exact locations are to be determined by actual measurements at the building, and will in all cases be subject to the approval of the Architect and he reserves the right to make any reasonable changes in the locations indicated without additional cost.

H. The contractor shall not make a change in a system, system layout, and/or equipment, except he receive written approval or drawing over the signature of the engineer.

1.8 SUBMITTAL OF EQUIPMENT FOR APPROVAL

A. Refer to the Conditions of the Contract (General and Supplementary) and Division 1 General Requirements for submittal definitions, requirements and procedures.

B. SHOP DRAWINGS AND PRODUCT DATA OF EQUIPMENT BEING INSTALLED IN THE PROJECT: After the contract is awarded, but prior to manufacture of installation of any equipment, assemble Shop Drawings, parts lists, Brochures, etc., for the materials and equipment requiring approval for each section of this specification. A brief description of submittal conditions is given below. Refer to identified sections for detailed submittal requirements.

C. Confirm equipment approved for the project.

1. Confirm that the equipment is approved for installation. It must be defined as to name, catalog number or both in the bid documents, which includes the published addendums. If not approved, do not submit.

2. Each unit shall state the name of the equipment manufacturer (name, address, phone, email, etc.) catalog number, size, physical dimensions and weight, energy characteristics (electrical and/or fuel), operating characteristics, materials from which constructed, any special conditions that may apply to the construction of the unit, etc.

3. The equipment must explain and define in detail the components that make-up the unit, so the owner and engineer can determine, define the replaceable parts during the life of the unit.
4. Complete operating instruction, normal maintenance recommendations, start-up procedures, etc.
5. In general, the contractor shall acquaint himself with the equipment to confirm that it can be installed as shown on the plans and from his experience perform the indicated function in the system where installed.
6. In the course of reviewing the shop drawings, the Contractor shall confirm the energy usage (gas, power, air, water, drains, etc.) and determine if these services are available at the equipment characteristics. Namely: confirm voltage, phase, etc., with the electrical contractor. Natural gas available with the plumber, also drains, water (hot and cold) pipe sizes, etc., or if there is discrepancies in the services. If the indicated equipment services are not available, inform the engineer by phone and in writing, also note on the shop drawing. This cooperative effort will correct a problem before the equipment arrives at the job site.
The shop drawings shall also indicate the scheduled delivery dates the equipment will be at the site.

If the contractor foresees any problems with equipment size, weight, delivery, etc., it shall be noted in writing, attached to the shop drawings.

1.9 RECORD DOCUMENTS
A. Contractor shall record differences between mechanical work as installed and as shown in Contract Documents on a set of prints of mechanical drawings to be furnished by Architect. Return these prints to Architect at completion of project. Notations made on drawings shall be neat and legible. Comply with Division 1 General Requirements.

1.10 OPERATION AND MAINTENANCE MANUALS
A. Contractor shall prepare and submit Operation and Maintenance Manuals for mechanical systems provided under this Contract. Comply with Division 1 requirements for procedures and requirements for preparation and submittal of manuals.
B. Manual binder shall have permanent lettering of a contrasting color. Information to be included on the binder is as follows:
C. The front cover shall be lettered as follows:

MECHANICAL OPERATION AND MAINTENANCE MANUAL
(PROJECT NAME)
(CITY AND STATE)
(YEAR)

OWNER: (NAME)
ARCHITECT: (NAME)
MECHANICAL ENGINEER: Nielson Engineering Inc.
GENERAL CONTRACTOR: (NAME)
MECHANICAL CONTRACTOR: (NAME)
The spine shall be lettered as follows:

MECHANICAL O & M MANUAL  (Year)
(Project Name)

D. Provide a master index at beginning of Manual showing items included. Use plastic tab indexes for sections of Manual.

E. Cover section shall consist of name, address, and phone number of Project Architect, General Contractor, Mechanical Engineer, Mechanical Contractor and all Mechanical Sub-Contractors.

F. Provide a separate section for each section of the specifications. Provide index for each section listing equipment included. Include all items specified in Sections 15050 through 15900. Provide a list of each type of equipment supplied with the local supplier’s name, address and phone number.

G. Include descriptive literature (manufacturer's catalog data) of each manufactured item. Literature shall show capacities and size of equipment used and be marked indicating each specific item with applicable data underlined. Data sheets shall be original. Copies are not acceptable.

H. One (1) copy of the manual shall be submitted for review and approval by the Engineer. After approval, submit three (3) copies of manual to the Owner for approval unless otherwise directed by Division 1 requirements. Information to be included in manual:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.
2. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping shut-down, and emergency instructions; and summer and winter operating instructions.
3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
4. Servicing instructions and lubrication charts and schedules.
5. Schematic control diagrams (as built-status) for each automatic control system. Mark correct operating setting for each control instrument on these diagrams. A second complete set of control diagrams encased in clear plastic laminate shall be furnished.
6. Valve schedule indicating the valve symbol (tag number), valve location by room number and description, valve purpose and system served, and valve size. Provide one corresponding set of full size mechanical prints (as-built status) showing these valve locations for cross-reference. A second complete set of valve schedules (8-1/2 in. x 11 in.) encased in clear plastic laminate and fitted in an aluminum holding frame shall be furnished to the Owner.
8. Test records and certifications.
9. Instruction period checklist.
10. Warranty information.
1.11 OPERATION AND MAINTENANCE INSTRUCTION AND TRAINING

A. The Contractor shall instruct the Owner's Representative(s) in the Operation and Maintenance procedures described in the Operation and Maintenance Manual. Comply with Division 1 requirements.

B. Individuals present shall include Contractors, Subcontractors, and equipment factory representatives. These individuals shall assist in instruction and start-up.

C. Minimum instruction time shall be eight (8) hours unless otherwise specifically noted.

D. All mechanical systems shall be properly functioning prior to instruction period.

E. Contractor shall prepare a checklist of all equipment and systems requiring instruction and maintenance for verification by the Owner's Representative of satisfactory start-up and instruction. A copy of this checklist shall be included in the Operation and Maintenance Manual.

1.12 GUARANTEE

A. Contractor shall guarantee the satisfactory operation of all material and equipment installed under Division 15 and shall repair or replace to the satisfaction of the Owner or Architect, any defective materials, equipment, or workmanship which may show itself within one year from the date of acceptance.

1.13 CLEANING

A. The Contractor shall, at all times, keep the premises free from accumulations of waste material or rubbish.

B. At completion of the job, the Contractor shall remove all tools, scaffolding, and surplus materials.

PART 2 - PRODUCTS

2.1 GENERAL MATERIALS AND EQUIPMENT REQUIREMENTS

A. All materials, in general, shall conform to the requirements of all agencies or publications specified and described in Division 1 of the Contract Specifications.

B. Materials and equipment to be provided shall be the standard catalog products of manufacturers regularly engaged in the manufacture of products conforming to these specifications, and shall essentially duplicate materials and equipment that have been in satisfactory use at least two years.

C. All pipe, fittings, and valves shall be domestic (USA) manufactured.
2.2 LISTED EQUIPMENT

A. The Idaho State Electrical Code requires that all materials, devices, appliances, and equipment, shall be of a type that conforms to applicable standards or be indicated as acceptable by the established standards of the Underwriter's Laboratories, Inc. or other electrical product testing laboratories which are accredited by the department.

B. This statement is being interpreted by the State Electrical Inspector as follows: It is understood that many specialty items such as cast iron boilers, certain items of air handling equipment and other building components are not available with a UL label covering the entire piece of equipment. The State will impose no requirement that an item of equipment be UL labeled unless it is available as a UL labeled items from at least two manufacturers. Electrical components of unlabeled equipment, such as motors, shall be labeled if they are available from at least two manufacturers.

C. If any building component is available with a UL label from at least two manufacturers, an identical or similar unlabeled component shall not be acceptable for installation in the State of Idaho. Should any such component be installed in the State of Idaho, it shall either be inspected and labeled by a UL representative or other authority approved by the State or it shall be replaced with a UL labeled component, before the building will be accepted by the State Electrical Inspector.

D. Consequently, it shall be the sole responsibility of the Contractor (through project suppliers and equipment manufacturers) to purchase and install only equipment bearing the UL label whenever that equipment so labeled is available. The Contractor, (should any equipment be installed without the proper UL label) shall bear the entire cost of correction to the satisfaction of the Idaho State Electrical Inspector.

2.3 SUBSTITUTIONS AND PRODUCT OPTIONS

A. Substitute equipment is encouraged if it is truly an equal to the specified items.

1. The items and/or equipment specified in the contract documents are standard manufacturers items found in suppliers catalogs, except it be indicated as special. The designer has taken time and effort to analyze, evaluate and prove to himself that the specified units will perform the function needed, wherein it is placed. This means the responsibility for the function of the specified equipment rests with the designer, who knows and understands what is to be accomplished.

2. If a supplier and/or the contractor desire to substitute equipment in place of a specified item, he may do so, but he takes upon himself or herself the full responsibility that the substituted equipment will equal all of the performing characteristics, functions, etc., and/or exceed the performance of the specified item. The substitute equipment shall be of such a physical size and weight that it will mount in the designated location without alterations to the building and the structure will carry the load. If for any reason the substitute equipment requires alterations or modification, in any form to the building and/or the structure, the costs shall be paid by the contractor and/or those requesting the substitutions.
3. Those interested in requesting a substitution shall submit a substitution request. The substitution request will be considered if it is at the office of the Engineer eight (8) working days prior to the day of bidding. The request shall include the following:
   a. A statement certifying that the equipment proposed is equal to that specified; that it has the same mechanical operating characteristics, compatible dimensions, weight, electrical characteristics and meets the function and intent of the equipment named in the contract documents
   b. The specification and catalog numbers of the substituted equipment
   c. A pictorial and specification brochure.

4. Because of the short bidding period, (from issuance of drawing to bid date), between the substitution request and the bid date, the designer does not have adequate time to make a full evaluation of substitute equipment. Therefore, those requesting the substitution must accept full responsibility for the items being submitted for substitution (operating characteristics, physical size, weight, output, not increase the load, etc.). If at any time during the course of construction, even up into the final completion, if the designer finds the equipment does not meet the design criteria, comply with the performance, etc., those requesting the substitution and the contractor have the responsibility to remove the substituted equipment and install the specified item at their expense. There shall be no cost assessed to the owner and/or the designer and the replacement will not delay the completion of the project.

D. Discrepancies between equipment specified and the intended function of equipment shall be brought to the attention of the Architect/Engineer in writing prior to bidding. Failure to report any conflict, including catalog numbers, discontinued products, etc., does not relieve the Contractor from meeting the intent of the contract documents, nor shall it change the contract cost. If the Contractor is unable to interpret any part of the plans and/or specifications, or should he find discrepancies therein, he shall bring this to the attention of the Architect/Engineer, who will issue interpretation and/or additional instructions to Bidders before the project is bid.

E. Any conflict arising from the use of substituted equipment shall be the responsibility of the contractor, who shall bear all costs required to make the equipment comply with the intent of the contract documents.

F. Samples may be required for non-standard or substituted items before installation during construction. Provide all samples as required.

G. No materials or apparatus may be substituted after the bid opening except where the equipment specified has been discontinued. This substitution may be made by a change order.

H. Approved equipment shall be so noted, in writing in a formally issued Project Addendum.

PART 3 - EXECUTION

3.1 COORDINATION

A. Each Contractor shall at all times cooperate with other trades on the job to avoid friction and delay to the progress of work. All points in dispute shall be referred to the Architect.
3.2 SUPERVISION

A. This Contractor shall have in charge of the work at all times a thoroughly competent superintendent. Comply with Division 1 requirements.

3.3 WORKMANSHIP

A. The work under the mechanical contract shall be performed by workers skilled in the particular trade and include all work necessary to properly complete the installation in a professional manner so as to present a neat and finished appearance.

3.4 EXAMINATION OF SITE

A. The Contractor shall visit the site of the proposed work and become familiar with the conditions affecting the work. Contractor shall verify all measurements at the building before beginning work.

3.5 SITE UTILITY SERVICES

A. Where applicable, the Contractor shall make connections to existing permanent cold water service immediately so as to provide the use of this service by other trades. Comply with Division 1 requirements.

3.6 EXISTING UTILITIES AND PIPING

A. The locations of existing concealed lines and connection points have been indicated as closely as possible from available information. The Contractor shall assume that such connection points are within a 10-foot (10') radius of the indicated locations. Where connection points are not within this radius, the Contractor shall contact the Architect for a decision before proceeding or may proceed at his own expense.

B. Existing piping (hot and cold water), vent lines, drain lines, roof drains, etc., that are found to obstruct the construction area (walls, floors and ceilings) and obstruct the removal of a wall, doorway or passageway, etc., shall be rerouted and/or relocated to clear the construction. The cost for this work shall be included as a part of the project and shall be covered in the contractor’s base bid.

C. If supply and/or return air ducts or exhaust ducts fall within or obstruct construction area for whatever reason, the contractor shall relocate these items to allow construction to proceed. The cost for this work shall be included as a part of the base bid.

D. Existing extensions: piping (water, drain, vent, air, etc.), ductwork, etc., that are noted to be extended and/or retrofit (for whatever reason) to accommodate added and/or new areas or facilities shall accomplish the intent for which the system was designed. When complete, the system and/or systems shall function as if they were new. This work shall be included in the base bid for the project.

Note: The specifications identify each system herein mentioned and the extension and additions shall adhere to the specifications defined for this phase of construction.
3.7 LAYING OUT WORK

A. Locations of equipment and devices, as shown on the drawings, are approximate unless dimensioned. Exact locations of such items shall be determined by the Architect's representative and/or secured from special details and drawings. Verify the physical dimensions of each item of mechanical equipment to fit the available space and promptly notify the Architect/Engineer prior to roughing-in if conflicts appear. Coordination of equipment to the available space and to the access routes through the construction shall be the Contractor's responsibility.

B. The contractor shall hand deliver to the general contractor a written statement and/or a manufacturer’s brochure on the equipment being installed at each location. The information shall give the dimensions and weight (loads) of each unit being installed. The general contractor shall forward a copy of this information to the structural engineer and obtain from him confirmation that the building structure will accommodate the loads. If there be any problem the questioning party shall notify the mechanical engineer by phone and in writing.

3.8 CONTRACTOR COORDINATION

A. In the course of installing the systems defined in the contract documents, the contractor shall closely follow the plans, details and specifications (contract documents). The system design has been a careful and laborious undertaking, with the intent purpose of producing a system and/or systems that will serve the owner well with a minimum of maintenance. Thence, the contractor shall adhere as closely as possible to the plans, details and specifications for each system. Questions and suggestions are encouraged as the project is being assembled. If for any reason, the contractor feels to deviate from the defined information, and finds a way, to improve the system, to make the system more easily assembled, make it operate more efficiently, etc., the contractor shall suggest the change to the engineer. Systems are designed to perform a specific function; the most minute change in assembly may change the function. If the engineer agrees with the change he will authorize the contractor to proceed. Contractor cooperation and coordination is appreciated. If the contractor proceeds on construction without the designer’s authorization, it shall be reworked, in accordance to plans and specifications, which work shall be at the contractor’s expense.

3.9 CUTTING AND PATCHING

A. All cutting and patching of new or existing construction required for installation of mechanical systems and equipment specified in Division 15 shall be the responsibility of the Mechanical Contractor unless otherwise noted. Comply with Division 1 for general requirements for cutting and patching.

B. All cutting shall be performed with masonry saws, core drills or similar equipment to provide neat and uniform openings.

C. All patching shall match adjacent surfaces in materials and finish. Do not endanger or damage installed work through procedures and processes of cutting and patching.

D. Arrange for repairs required to restore other work, because of damage caused as a result of mechanical installations.
E. No additional compensation will be authorized for cutting and patching work that is
necessitated by ill-timed, defective, or non-conforming installations.

F. Perform cutting, fitting, and patching of mechanical equipment and materials required to:

1. Uncover work to provide for installation of ill-timed work.
2. Remove and replace defective work.
3. Remove and replace work not conforming to requirements of the Contract Documents.
4. Remove samples of installed work as specified for testing.
5. Install equipment and materials in existing structures.

G. Upon written instructions from the Architect/Engineer, uncover and restore work to provide
Architect/Engineer observation of concealed work.

H. Cut, remove and legally dispose of selected mechanical equipment, components, and materials
as indicated, including, but not limited to removal of mechanical piping, heating units,
plumbing fixtures and trim, and other mechanical items made obsolete by the new work.

I. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to
be removed.

J. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of
dust and dirt to adjacent areas.

3.10 EXCAVATION AND BACKFILL

A. Contractor shall provide all necessary excavation, shoring, and backfilling required for proper
installation of mechanical work inside and outside the building. During excavation, material
satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the
banks of the trench equal to ½ the depth of the excavation, but in no instance closer than 2
feet. Excavated material not required or not satisfactory for backfill shall be removed from the
site and shall be disposed of in designated areas approved for surplus material storage.
Grading shall be done as necessary to prevent surface water from flowing into the excavation,
and any water accumulating therein shall be removed so that the stability of the bottom and
sides of the excavation is maintained.

B. Trenches shall be excavated to depth indicated or required to establish indicated slope and
invert elevations and to support bottom of piping or conduit on undisturbed soil. Trenches shall
be of uniform width, sufficient to provide ample working room and a minimum of 6 to 9
inches of clearance on both sides of pipe or conduit.

C. The bottoms of trenches shall be accurately graded to provide uniform bearing and support for
the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary
size at each joint or coupling to eliminate point bearing. Stones of 3 inches or greater in any
dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be
removed to avoid point bearing. Where unyielding material is encountered in the bottom of
the trench, such material shall be removed 6 inches below the required grade and replaced with
materials described below for bedding.
D. Excavation for manholes, catch basins, inlets, or similar structures shall be sufficient to leave at least 12 inches clear between the outer structure surfaces and the face of the excavation or support members. When concrete or masonry is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

E. Bedding material shall be clean, sand-gravel mixture free from organic matter and conforming to the following gradation when tested in accordance with ASTM D 422.

<table>
<thead>
<tr>
<th>U.S. Standard</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Inch</td>
<td>100</td>
</tr>
<tr>
<td>No. 4</td>
<td>25-80</td>
</tr>
<tr>
<td>No. 200</td>
<td>0-10</td>
</tr>
</tbody>
</table>

F. Bedding material shall be placed to a depth of 6 inches (6") over the top of piping. The bedding shall be brought up evenly on both sides of the pipe for the full length of the pipe.

G. Backfill for the remainder of the trench shall be satisfactory soil materials complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP.

H. Backfill soil materials shall be free of clay, rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.

I. Backfill to the required grade shall be placed in layers not exceeding 6 inches loose thickness for compaction by hand operated machine compactors, and 8 inches loose thickness for other than hand operated machines otherwise specified. Each layer shall be compacted to density as specified in Section 02200.

J. No underground lines shall be covered until the installation has been approved by the inspector having jurisdiction and the Owner's Representative.

K. Provide 4 inch thick concrete base slab support for piping less than 2'-6" below surface of roadways. After installation and testing of piping, provide minimum 4 inch thick encasements (sides and top) of concrete prior to backfilling or placement of roadway subbase.

L. Bracing and shoring shall be provided where depth of excavation or character of ground render it necessary for personnel protection. Shoring shall be constructed of heavy timber planking with timber supports and shall conform with local and state safety laws and regulations.

M. Removal of bracing and shoring materials shall be done before backfilling except where necessary to insure against caving; in which case, it shall be withdrawn while backfilling is being done.

N. Provide barricades around all excavation. Barricades to be securely constructed.
O. The Contractor shall exercise extreme care while excavating in the area of utilities, carefully check for location of all possible utilities, whether shown on the drawings or not, and establish the location of all cutoff valves for ready shut-off of service in case of emergency. The Contractor shall be completely responsible for all damage to any utilities caused in excavating as well as damage to personnel and property caused by said damaged utilities whether shown on the drawings or not.

3.11 REPLACEMENT OF PAVING AND CONCRETE
A. All existing or new sidewalks, concrete paving, curbs, or asphalt paving removed or damaged by this Contractor during the period of the installation or as a result thereof, shall be replaced with like material in a manner as directed by and to the satisfaction of the Owner's Representative. Comply with Division 2 General Requirements.

3.12 OPENINGS IN PIPES AND DUCTS
A. All temporary openings in pipes and ducts shall be capped or sealed during construction. Caps shall be removed for final connections.

3.13 PROTECTION OF MATERIALS AND EQUIPMENT
A. Contractor shall be held responsible for any and all materials and equipment to be installed under this contract and will be required to make good at his own cost any injury or damage which materials or equipment may sustain from any source or cause whatsoever before final acceptance. Comply with Division 1 requirements.

3.14 DELIVERY, STORAGE, AND HANDLING
A. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.
B. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage.
C. Coordinate deliveries of mechanical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

3.15 ACCESSIBILITY
A. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing.
B. Access doors or hatches required for servicing of mechanical equipment shall be furnished and installed as specified in the other Divisions of the Specifications.
3.16 PAINTING

A. Contractor shall touch-up scratched or damaged factory finishes of mechanical equipment. Comply with Division 1 requirements.

B. Unless otherwise noted, all other painting of mechanically related items shall be according to Division 9, Section 09900 "PAINTING".

3.17 LUBRICATION

A. Contractor shall properly lubricate all pieces of equipment before turning the building over to the Owner. Comply with Division 1 requirements.

3.18 FINAL CLEANING

A. Refer to Division 1 for general requirements for final cleaning.

B. At time of final cleanup, all fixtures and equipment shall be thoroughly cleaned and left in condition for use.

3.19 FIRE PENETRATION SEALS

A. All penetrations through fire rated floors and walls shall be sealed to prevent the spread of smoke, fire, toxic gas or water through the penetration before, during or after a fire. The fire rating of the penetration seal shall be at least that of the floor to wall into which it is installed so that the original fire rating of the floor or wall is maintained.

B. The sealant shall remain soft and pliable to allow for the removal and/or addition of piping without the necessity of drilling holes. It shall adhere to itself to allow any and all repairs to be made with the same material. It shall permit the vibration, expansion and/or contraction of piping and ducts going through the penetration without the seal cracking or crumbling.

C. When damming materials are to be left in place after the seal is complete, all such materials shall be non-flammable.

D. When sealant is injected into a penetration, the foam shall expand to surround all items within the penetration and maintain pressure against the walls of the penetration. The foam shall cure within five minutes and be fire resistant at that time. No heat shall be required to further expand the foam to block the passage of fire and smoke or water.

E. All wall or floor penetration openings shall be as small as possible.

F. The foam sealant shall meet all of the fire test and hose stream test requirements of ASTM E119-73 and shall be UL classified as a Wall Opening Protective Device. The sealant shall be CHASE-FOAM, CTC PR-855 Fire Resistant Foam Sealant from Chase Technology Corporation, Huntington Station, New York 11746 or 3M Brand Fire Barrier caulking CP25, putty 303, wrap/strip FS 195 or sheet CS 195 from 3M Products Divisions, 224-4N 3M Center, St. Paul, MN 55144-1000.
3.20 TESTING, ADJUSTING, AND BALANCING

A. The air distribution systems shall be balanced by a Balancing or Engineering Firm with five years experience in HVAC design and balancing. The report shall be stamped by a licensed engineer and certified by NEBB. The Balancing firm shall furnish the necessary instruments for making tests and performing work. The Mechanical Contractor shall include in his contract all costs including the Balancing Firm's charges.

B. Balancing work shall not be started until such time as the following conditions are completely fulfilled:

1. All systems shall be completely installed and shall have been successfully test run, and fully operational.
2. All outlets, dampers, balancing devices, and accessories shall be completely installed.
3. Filters and strainers shall be clean.
4. All wiring shall be completed, including all interlocks and heaters.
5. Control system shall be completely installed, tested, and all instruments shall be calibrated.
6. Proper fan rotation shall be verified.

C. The Contractor shall furnish the project foreman to aid the Balancing Firm in balancing the system. The foreman shall be in constant attendance and shall make all equipment adjustments as required.

D. The Contractor shall furnish all ladders, scaffolding, and tools required for access and adjustment. High scaffolding will be required in areas with ceiling over 12 ft.

E. The Contractor shall furnish and install all required exchanges of adjustable sheaves and V-belt drives necessary for proper balance of the system to obtain the desired air balancing of systems.

F. The Automatic Controls Subcontractor shall furnish a man, available upon request, to make necessary adjustments in the control system during the balancing.

G. The balancing agency shall submit in quadruplicate on neat and legible forms the full report of systems operation, initial and final readings.

H. All instruments used for measurements shall be accurate and calibration histories for each instrument shall be available for examination. The Mechanical Engineer has the right to request instrument recalibration, or the use of other instruments, where accuracy of readings is questionable.

I. Furnish in the report a written guarantee to be effective for one year from the date of acceptance, to make any and all adjustments required to maintain comfort in all rooms and areas.
J. Air balancing shall include the following:

1. Set supply and exhaust fans at design speeds and record average amperage readings on all motor phases, static pressures and CFM of air flow in each system.
2. Read air flows at registers, grilles, and diffusers with a velometer or equal air measuring device. Adjust dampers as required. Outlets shall be adjusted to design CFM plus or minus 10%.
3. Adjust minimum outside air dampers to design CFM or 10% of supply air total CFM.
4. Adjust fans as required to meet design. Check for drafts, noise and vibration.
5. After balancing is complete, mark final position of balancing dampers.
6. Report any discrepancies immediately to the Mechanical Design Engineer.

K. Upon completion of testing, adjusting and balancing of the air and/or water systems, prepare a complete and legible draft report. Submit two (2) copies of the draft report to the Mechanical Design Engineer for review.

L. Upon verification and approval of the draft reports, prepare final reports. Four (4) typewritten, organized and formatted copies of the final report are required. Furnish one (1) copy to the Mechanical Design Engineer for his record, and the remaining three (3) copies are to be included in the Owner's Operation and Maintenance Manuals.

END OF SECTION 15010
SECTION 15030 - ELECTRICAL PROVISIONS OF MECHANICAL WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this section.

1.2 SUMMARY

A. This section specifies the basic requirements for electrical components which are an integral part of packaged mechanical equipment. These components include, but are not limited to factory installed motors, starters, and disconnect switches furnished as an integral part of packaged mechanical equipment.

B. Specific electrical requirements (i.e. horsepower and electrical characteristics) for mechanical equipment are specified within the individual equipment specifications or scheduled on the drawings.

C. All magnetic motor starters and disconnect switches not furnished as an integral part of packaged mechanical equipment shall be provided under Division 15 - Mechanical.

D. Wiring from motors of mechanical equipment to disconnect switches or junction boxes, including pushbuttons, pilot lights, interlocks, speed controllers, and similar devices shall be the responsibility of this Contractor under Division 15 where not specifically indicated under Division 16.

E. Wiring of field-mounted float control switches, flow control switches, and similar mechanical/electrical devices provided for mechanical systems, to equipment control panels shall be the responsibility of this Contractor under Division 15 where not specifically indicated under Division 16.

F. Wiring required for Automatic Controls Section 15900 shall be the responsibility of this Contractor under Division 15.

1.3 REFERENCES

A. NEMA Standard MG1: Motors and Generators.

B. NEMA Standard ICS2: Industrial Control Devices, Controllers and Assemblies.


1.4 SUBMITTALS

A. No separate submittal is required. Submit product data for motors, starters, and other electrical components with submittal data required for the equipment for which it serves as required by the individual equipment specification sections.

1.5 QUALITY ASSURANCE

A. All electrical components and materials shall be labeled by an approved testing agency (UL, ETL, CSA, etc.).

PART 2 - PRODUCTS

2.1 MOTORS

A. The following are basic requirements for simple or common motors. For special motors, more detailed and specific requirements are specified in the individual equipment specifications.

1. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.
2. Motor sizes shall be large enough so that the driven load will not require the motor to operate in the service factor range.
3. Two-speed motors shall have two separate windings on poly-phase motors.
4. Temperature Rating: Rated for 40°C environment with maximum 50°C temperature rise for continuous duty at full load (Class A insulation). Service Factor: 1.15 for poly-phase motors and 1.35 for single phase motors.

B. Motor Construction: NEMA Standard MG 1, general purpose, continuous duty, Design "B", except "C" where required for high starting torque.

C. Frames: NEMA Standard No. 48 or 54; use driven equipment manufacturer's standards to suit specific application.

D. Bearings: Ball or roller bearings with inner and outer shaft seals; regreaseable, except permanently sealed where motor is normally inaccessible for regular maintenance; designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor; for fractional horsepower, light duty motors, sleeve type bearings are permitted.

E. Enclosure Type: Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation; guarded drip-proof motors where exposed to contact by employee or building occupants; weather-protected Type I for outdoor use, Type II where not housed.

F. Overload Protection: Built-in thermal overload protection and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.

G. Noise Rating: "Quiet" rating on motors located in occupied spaces of building.
H. Efficiency: "Energy efficient" motors shall have a minimum efficiency as scheduled in accordance with IEEE Standard 112, test method "B". If efficiency not specified, motors shall have a higher efficiency than "average standard industry motors", in accordance with IEEE Standard 112, test method "B".

I. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features, and similar information.

2.2 STARTERS, ELECTRICAL DEVICES, AND WIRING

A. Motor Starter Characteristics: Enclosures NEMA, general purpose enclosures with padlock ears, except in wet location shall be NEMA 3R with conduit hubs. Type and size of starter shall be as recommended by motor manufacturer and the driven equipment manufacturer for applicable protection and startup condition.

B. Manual switches shall have pilot lights and extra positions for multi-speed motors. Overload protection shall be melting alloy type thermal overload relays.

C. Magnetic starters shall have maintained contact pushbuttons and pilot lights, properly arranged for single speed or multi-speed operation as indicated; trip-fee thermal overload relays each phase, interlocks, pneumatic switches and similar devices as required for coordination with control requirements of Division 15 Controls sections, built-in 120 volt control circuit transformer, fused from line side, where service exceeds 240 volts; externally operated manual reset, under-voltage release or protection.

D. Motor connections shall have flexible conduit, except where plug-in electrical cords are specifically indicated.

2.3 CAPACITORS

A. Features shall include individual unit cells, all welded steel housing, each capacitor internally fused, non-flammable synthetic liquid impregnated, craft tissue insulation and aluminum foil electrodes.

B. KVAR size shall be as required to correct motor power factor to 90 percent or better and shall be installed on all motors 1 horsepower or larger, that have an uncorrected power factor of less than 85 percent at rated load.

PART 3 - EXECUTION

(Not Applicable).

END OF SECTION 15030
SECTION 15060 - PIPE AND PIPE FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -
   1. General piping installation procedures for all piping systems.

B. Related Sections -
   1. General Conditions, Division 01, and Section 15010 apply to this Section.
   2. Type of pipe and fittings specified under each piping system.

1.2 QUALITY ASSURANCE

A. Manufacturer -
   1. Use domestic (USA) made pipe and pipe fittings on Project.

PART 2 - PRODUCTS

2.1 VALVES

A. Valves of same type shall be of same manufacturer.

B. Valves shall be domestic (USA) on this project.

2.2 PIPE HANGERS

A. Adjustable, malleable iron clevis type of a diameter adequate to support pipe size.

B. Approved Manufacturers -
   1. B-Line Systems Fig. B3100
   2. Grinnell No. 260
   3. Kin-Line 455
   4. Superstrut CL-710

2.3 INSULATING COUPLINGS

A. Suitable for at least 175 PSIG WP at 250/F.

B. Approved Manufacturers -
   1. Central Plastics Co
   2. Victualic Co
   3. Watts Regulator Co
2.4 SLEEVES

A. Sleeves shall be standard weight galvanized iron pipe, Schedule 40 PVC, or 14 gauge galvanized sheet metal two sizes larger than pipe or insulation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Division from responsibility for proper erection of systems of piping in every respect.

B. Properly support piping and make adequate provisions for expansion, contraction, slope, and anchorage.

1. Cut piping accurately for fabrication to measurements established at site and work into place without springing or forcing.
2. Do not use pipe hooks, chains, or perforated metal for pipe support.
3. Remove burr and cutting slag from pipes. All pipe and tube shall be reamed to the full inside diameter of the pipe and tube.
4. Make changes in direction with proper fittings.
5. Insulate hangers for copper pipe from piping by means of at least two layers of Scotch 33 plastic tape.
6. Support piping at 8 feet on center maximum for pipe 1-1/4 inches or larger and 6 feet on center maximum for pipe one inch or less. Provide support at each elbow. Install additional support as required.
7. Suspend piping from roof trusses or clamp to vertical walls using Unistrut and clamps (except underground pipe). Laying of piping on any building member is not allowed.

C. Arrange piping to not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings. Provide accessible, ground joint unions in piping at connections to equipment.

D. Make connections of dissimilar metals with insulating couplings.

E. Provide sleeves around pipes passing through floors, walls, partitions, or structural members.

1. Seal sleeves with plastic or other acceptable material.
2. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete floors on grade.

F. Cap or plug open ends of pipes and equipment to keep dirt and other foreign materials out of system. Do not use plugs of rags, wool, cotton waste, or similar materials.

G. Install piping systems so they may be easily drained.
H. Grade soil and waste lines within building perimeter ¼ inch fall per ft in direction of flow or as noted on the plans.

I. Insulate water piping buried within building perimeter.

J. Do not use reducing bushings, street elbows, or close nipples.

K. Bury water piping 6 inches minimum below bottom of slab and encase all water lines in PVC or ABS sleeves, a minimum of 2 pipe sizes larger than water line being encased and the insulation installed on this piping. Install 2 inches minimum of sand around the encasement pipe.

END OF SECTION 15060
SECTION 15170 - MOTORS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -
   1. Quality of motors three horsepower or larger furnished and installed by Division 15.

B. Related Sections -
   1. General Conditions, Division 01, and Section 15010 apply to this Section.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Motor shall be quiet in operation and speed not exceed 1800 rpm.

2.2 APPROVED MANUFACTURERS

A. Allis Chalmers

B. General Electric

C. Gould/Century

D. Lincoln

E. Marathon

F. Reliance

G. Toshiba

H. U S

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 15170
SECTION 15190 - MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -
   1. Furnish and install identification of equipment and piping as described in Contract Documents.

B. Related Sections -
   1. General Conditions, Division 01, and Section 15010 apply to this Section.

PART 2 - PRODUCTS

2.1 PAINT

A. Benjamin Moore Impervo or equivalent by Paint Manufacturer approved in Architectural Painting Sections.

B. Use appropriate primer.

2.2 LABELS

A. Black Formica with white reveal on engraving. PART 3 - EXECUTION

3.1 APPLICATION

A. Engraved Plates -
   1. Identify thermostats and control panels in mechanical rooms, furnaces, boilers and hot water heating specialties, duct furnaces, air handling units, electric duct heaters, and condensing units with following data engraved and fastened to equipment with screws -
      a. Equipment mark noted on Drawings (i.e., CU-1)
      b. Area served (i.e., Gym, Administration)

B. Stenciling -
   1. Locate identifying legends and directional arrows at following points on each piping system -
      a. Adjacent to each item of equipment and special fitting.
      b. At point of entry and exit where piping goes through wall.
      c. On each riser and junction.
      d. Every 50 feet on long continuous lines.
2. Domestic Hot & Cold Water Piping Identification -
   a. Identify domestic hot and cold water piping above and below ceilings with
      stenciled letters "HW" and "CW" respectively.
   b. Letters shall be one inch high. Provide "Direction of Flow" arrow at each stencil.
   c. Paint color shall be as specified below.

3. Steam Pipe, Hot Water Heating, Chilled Water, Gas, & Valve Identification -
   a. Identify specific pipe contents by stenciling pipe with written legend and placing
      of arrows to indicate direction of flow.

C. Painting: All pipe painting shall be provided for by the installing contractor i.e.: Fire
   sprinkling by the Fire Sprinkler contractor, plumbing by the Plumbing Contractor.

D. Identification shall comply with, but not limited to the following:

   PIPE PAINTING AND LABELING LEGEND

<table>
<thead>
<tr>
<th>SERVICE &amp; LABEL</th>
<th>SYMBOL</th>
<th>LABEL COLOR*</th>
<th>LETTER</th>
<th>PIPE COLOR**</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOMESTIC COLD WATER</td>
<td>DCW</td>
<td>GREEN</td>
<td>WHITE</td>
<td>DARK ROYAL BLUE</td>
</tr>
<tr>
<td>DOMESTIC HOT WATER</td>
<td>DHW</td>
<td>YELLOW</td>
<td>BLACK</td>
<td>MAGENTA</td>
</tr>
<tr>
<td>DOM. HOT WATER RETURN</td>
<td>DHWR</td>
<td>YELLOW</td>
<td>BLACK</td>
<td>MAGENTA</td>
</tr>
<tr>
<td>SOFT COLD WATER</td>
<td>DSW</td>
<td>GREEN</td>
<td>WHITE</td>
<td>DARK ROYAL BLUE</td>
</tr>
<tr>
<td>RAIN WATER</td>
<td>RW</td>
<td>GREEN</td>
<td>WHITE</td>
<td>BROWN</td>
</tr>
<tr>
<td>SANITARY SEWER</td>
<td>SAN</td>
<td>GREEN</td>
<td>WHITE</td>
<td>BROWN</td>
</tr>
<tr>
<td>NATURAL GAS</td>
<td>G</td>
<td>YELLOW</td>
<td>BLACK</td>
<td>DARK GREEN</td>
</tr>
</tbody>
</table>

** Exposed piping in mechanical rooms, boiler rooms, etc., shall be painted color indicated on chart.

E. SIZE OF LETTERS AND LENGTH OF FIELD

<table>
<thead>
<tr>
<th>OD OF PIPE OR COVERING</th>
<th>SIZE OF LETTERS</th>
<th>LENGTH OF COLOR FIELD</th>
</tr>
</thead>
<tbody>
<tr>
<td>¾” TO 1-1/2”</td>
<td>½”</td>
<td>8”</td>
</tr>
<tr>
<td>1-1/2” TO 2”</td>
<td>¾”</td>
<td>8”</td>
</tr>
<tr>
<td>2-1/2” TO 6”</td>
<td>1-1/4”</td>
<td>12”</td>
</tr>
<tr>
<td>8” TO 10”</td>
<td>2-1/2”</td>
<td>24”</td>
</tr>
<tr>
<td>OVER 10”</td>
<td>3-1/2”</td>
<td>32”</td>
</tr>
</tbody>
</table>

F. Paint Specification: All surfaces to be painted shall be prepared in accordance with the
detailed painting specifications in the Painting Section of these specifications. Surfaces that
are not subjected to temperatures higher than 212 deg. F shall be painted as specified for the
area in which they are located. Pipes, valves or other equipment subjected to temperature
above 212 deg. F, shall be painted with heat resisting black enamel or heat resisting aluminum
paint as specified below. The Owner's Representative shall designate surfaces to be painted
aluminum painted at least three coats. Colors shall be selected by Owner's Representative.
G. Heat resisting black enamel shall be Sta-Black as manufactured by Pratt and Lambert Co., or Ebonite Boiler and Stack Paint as manufactured by W.P. Fuller Co. or approved equal suitable for use at temperatures of at least 450°F.

END OF SECTION 15190
SECTION 15261 - CULINARY WATER PIPE INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -

1. Furnish and install insulation on above ground hot and cold water lines, fittings, valves, and accessories as described in Contract Documents.

B. Related Sections -

1. General Conditions, Division 01, and Section 15010 apply to this Section.

PART 2 - PRODUCTS

2.1 INSULATION

A. Heavy density pipe insulation with factory vapor jacket equal to Fiberglas ASJ with Butt Joints.

B. Approved Manufacturers -

1. Manville
2. Owens-Corning
3. Knauf

2.2 PVC FITTING, VALVE, & ACCESSORY COVERS

A. Approved Manufacturers -

1. Knauf
2. Zeston

PART 3 - EXECUTION

3.1 APPLICATION

A. Piping -

1. Apply insulation to clean, dry piping with joints tightly butted.
2. Adhere "factory applied vapor barrier jacket lap" smoothly and securely at longitudinal laps with a white vapor barrier adhesive.
3. Adhere 3 inch wide self-sealing butt joint strips over end joints.
B. Fittings, Valves, & Accessories -

1. Insulate with same type and thickness of insulation as pipe, with ends of insulation tucked snugly into throat of fitting and edges adjacent to pipe insulation tufted and tucked in.
2. Cover insulation with one piece fitting cover secured by stapling or taping ends to adjacent pipe covering.
3. Alternate Method -
   a. Insulate fittings, valves, and accessories with one inch of insulating cement and vapor seal with two 1/8 inch wet coats of vapor barrier mastic reinforced with glass fabric extending 2 inches onto adjacent insulation.

C. Pipe Hangers -

1. Do not allow pipes to come in contact with hangers.
2. Provide 16 ga x 6 inch long galvanized shields at each pipe hanger to protect pipe insulation from crushing by clevis hanger.

D. No insulation shall be applied until piping has been pressure tested and approved.

E. In all cold attic situations where the building insulation is located at the ceiling, all piping installed in the ceiling to roof space shall be insulated as specified herein. In addition, install at 6" thick by 30" wide fiberglass blanket with vapor barrier (vapor barrier towards warm side of cavity) over the pipe to tent and allow heat loss through the ceiling to prevent the pipe from freezing. The insulation blanket shall be held in place by rolling it to a wood lathe and nailed to the joist. The building insulation shall then be applied over this pipe protection layer.

F. In room installations where excess moisture or humidity will be present, only the polyolefin or elastomeric insulation shall be used.

END OF SECTION 15261
SECTION 15262 - UNDERGROUND PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -

   1. Furnish and install insulation on underground hot and cold water pipes within confines of building as described in Contract Documents.

B. Related Sections -

   1. General Conditions, Division 01, and Section 15010 apply to this Section.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Insulation -

   1. ½ inch thick Armaflex Standard Pipe Insulation.

   2. Equal by Rubatex or IMCOA "ImcoLock".

B. Joint Sealant -

   1. Armstrong 520

PART 3 - EXECUTION

3.1 INSTALLATION

A. Slip underground pipe insulation onto pipe and seal butt joints.

B. Where slip-on technique is not possible, slit insulation, apply to pipe, and seal seams and joints.

END OF SECTION 15262
SECTION 15263 - REFRIGERANT PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -

1. Furnish and install insulation on above ground refrigerant suction piping and fittings, including thermal bulb, from thermal expansion valve as described in Contract Documents.

B. Related Sections -

1. General Conditions, Division 01, and Section 15010 apply to this Section.

PART 2 - PRODUCTS

2.1 FLEXIBLE FOAMED PIPE INSULATION

A. Thickness -

1. ½ inch for one inch outside diameter and smaller pipe.
2. 3/4 inch for 1-1/8 through 2 inch outside diameter pipe.
3. One inch for 2-1/8 inches outside diameter and larger pipe (two layers of ½ inch).
4. One inch sheet for fittings as recommended by Manufacturer.

B. Approved Manufacturers -

1. Armaflex
2. Rubatex
3. CSG "Ultrafoam"
4. IMCOA "ImcoLock"

2.2 JOINT SEALER

A. Approved Manufacturers -

1. Armaflex 520
2. BFG Construction Adhesive #105
3. Therma-Cel 950.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install insulation in snug contact with pipe and in accordance with Manufacturer's recommendations.
B. Stagger joints on layered insulation.

C. Slip insulation on tubing before tubing sections and fittings are assembled keeping slitting of insulation to a minimum.

D. Seal joints in insulation. Use black nylon 1" tie straps every two feet.

E. Insulate flexible pipe connectors.

F. Insulate thermal expansion valves with insulating tape.

G. Insulation exposed outside building shall have "slit" joint seams placed on bottom of pipe.

H. Insulate fittings with sheet insulation and as recommended by Manufacturer.

I. Paint exterior exposed insulation with two coats of white or gray finish recommended by Insulation Manufacturer, except on Therma-Cel insulation.

END OF SECTION 15263
SECTION 15290 - DUCTWORK INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -

1. Furnish and install insulation on air ducts outside building insulation envelope as described in Contract Documents.
2. Furnish and install insulation on supply, exhaust, return, and fresh air ducts and combustion air ducts within building insulation envelope.
3. Furnish and install insulation on other air ducts where indicated on Drawings.

B. Related Sections -

1. General Conditions, Division 01, and Section 15010 apply to this Section.
2. Section 15896 - Acoustical insulation inside air ducts.

PART 2 - PRODUCTS

2.1 INSULATION

A. 2 inch thick fiberglass with aluminum foil scrim kraft facing and have a density of .75 lb/cu ft. (R-Value = 5.6) (inside building envelope). The duct insulation shall meet the current International Energy Conservation Code (IECC).

B. 3 inch thick fiberglass with aluminum foil scrim kraft facing and have a density of .75 lb/cu ft. (R-Value = 8.4) (outside building envelope). The duct insulation shall meet the current International Energy Conservation Code (IECC).

C. Approved Manufacturers -

1. Manville Microlite FSK
2. CSG Type IV standard duct insulation
3. Owens-Corning FRK
4. Knauf (Duct Wrap FSK)

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct wrap in accordance with Manufacturer's recommendations (overlap insulation 4-inches).

B. Do not compress insulation except in areas of structural interference.

C. Completely seal joints.

END OF SECTION 15290
SECTION 15411 - CULINARY WATER PIPING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -

1. Furnish and install culinary water piping complete with necessary valves, connections, and accessories inside building and connect with outside utility lines 5 feet from building perimeter.
2. Perform excavating and backfilling required by work of this Section.

B. Related Sections -

1. General Conditions, Division 01, and Sections 15010, 15060 and 15190 apply to this Section.
2. Division 02 - Culinary water piping from 5 feet from building to main.
3. Division 02 - Criteria for performance of excavation and backfill.

1.2 SUBMITTALS

A. Quality Control -

1. Submit written report of sterilization test to Architect.

PART 2 - PRODUCTS

2.1 MANUFACTURING

A. All pipe & fittings shall be domestic (USA) manufacturer.

B. All valves shall be domestic (USA) manufacturer.

2.2 PIPE

A. Type K copper for piping underground or beneath concrete slab. 3/4 inch minimum under slabs. Trap primer supplies shall be ½ inch.

B. Type L hard drawn copper for above ground applications.

2.3 FITTINGS

A. Wrought copper.

2.4 CONNECTIONS

A. Sweat copper type with 95/5 or 96/4 Tin-Antimony solder.
B. Joints under slabs, if allowed by local codes, shall be brazed.

2.5 BALL VALVES

A. Use ball valves exclusively unless otherwise specified. Ball valves shall be by single manufacturer from approved list below. Valves shall be for 150 PSI SWP.

B. Approved Manufacturers -

1. Nibco-Scott T595 or S595 or equal by
2. ConBraCo (Apollo)
3. Crane
4. Hammond
5. Stockham
6. Watts

2.6 STOP & WASTE VALVES

A. Approved Manufacturers -

2. Buffalo screw type curb box H-10350 complete with lid and H-10349 enlarged base by Mueller.

2.7 BACKFLOW PROTECTIONS

A. Approved Manufacturers -

1. Watts No. 909 or No. 009AQ - R.P. Backflow Preventer.
2. FEBCO Model No. 825 or Model No. 880 - R.P. Backflow Preventer.
4. ConBraCo.

2.8 COMBINATION PRESSURE REDUCING VALVE/STRAINER

A. Integral stainless steel strainer, or separate 'Y' strainer installed upstream of pressure reducing valve.

B. Built-in thermal expansion bypass check valve.

C. Approved Manufacturers -

1. Watts U5B or equal by
2. Cash Valve
3. Spencer
4. Wilkins
PART 3 - EXECUTION

3.1 INSTALLATION

A. Install piping under slabs without joints where possible.

B. Locate cold water lines a minimum of 6 inches from hot water line.

3.2 FIELD QUALITY CONTROL

A. Before pipes are covered, test systems in presence of Architect at 100 psi hydrostatic pressure for two hours and show no leaks.

B. Sterilize domestic water system with solution containing 250 parts per million minimum of available chlorine. Introduce chlorinating materials into system in manner approved by Architect. Allow sterilization solution to remain for 24 hours and open and close valves and faucets several times during that time.

C. After sterilization, flush solution from system with clean water until residual chlorine content is less than 0.2 parts per million.

D. Water system will not be accepted until negative bacteriological test is made on water taken from system. Repeat dosing as necessary until such negative test is accomplished.

END OF SECTION 15411
SECTION 15412 - SOIL, WASTE, AND VENT PIPING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -

1. Furnish and install soil, waste, and vent piping systems within building and connect with outside utility lines 5 feet out from building where applicable.
2. Perform excavation and backfill required by work of this Section.

B. Products Furnished But Not Installed Under This Section -

1. Galvanized steel roof jacks.

C. Related Sections -

1. General Conditions, Division 01, and Sections 15010, 15060 and 15190 apply to this Section.
2. Division 02 - Criteria for performance of excavation and backfill.
3. Division 02 - Sewage piping from 5 feet out from building to main.
4. Division 02 - Storm sewer piping.
5. Division 07 - Installing of galvanized steel roof jacks.
6. Division 07 - Furnishing and installing of lead roof jacks.

PART 2 - PRODUCTS

2.1 MANUFACTURING

A. All pipe and fittings shall be domestic (USA) manufacturer.

2.1 BURIED LINES

A. Service weight, single-hub type cast iron soil pipe and fittings meeting the requirements of ASTM A 74, "Specification for Cast Iron Soil Pipe & Fittings". Service weight, no-hub cast iron pipe and fittings meeting the requirements of ASTM A 888, “Specifications for Cast Iron Soil Pipe and Fittings”.

B. Plastic pipe conforming to IAPMO and ASTM specifications will be acceptable where permitted by local code.

C. Joint Material -

1. 50% oakum and 50% lead, well calked.
2.2 ABOVE GRADE PIPING & VENT LINES

A. Same as specified for buried lines except no-hub pipe may be used.

B. Vent lines 2-1/2 inches or smaller may be Schedule 40 galvanized steel.

C. Plastic pipe conforming to IAPMO and ASTM specifications will be acceptable where permitted by local codes.

D. Joint Material -

1. Bell & Spigot Pipe - 50% oakum and 50% lead, well caulked, or rubber gaskets meeting requirements of ASTM C 564, "Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings".

2.3 BURIED AND ABOVE GRADE ACID WASTE AND VENT LINES

A. Schedule 40 polypropylene acid waste pipe, manufactured to dimensions and tolerances of ASTM F 1412. The pipe shall be fire retardant polypropylene material conforming to ASTM D4101.

B. Fitting shall be schedule 40 polypropylene, manufactured to dimensions as per ASTM F1412. The polypropylene material shall be fire retardant and conform to ASTM D4101.

C. Joining methods between the pipe and fittings shall be mechanical joint, meeting ASTM F 1412 or electrofusion to produce a hermetically sealed joint, conforming to ASTM 1290.

D. All acid waste lines and fittings above floor shall be insulated for noise abatement.

E. Approved products

1. Zurn
2. Orion

2.4 ABOVE GRADE ACID WASTE AND VENT LINES LOCATED IN PLENUM OR FIRE RATED ROOM OR STRUCTURE.

A. Schedule 40 polyvinylidene Fluoride (PVDF) acid waste pipe, manufactured to dimensions and tolerances of ASTM F1672. The pipe shall be fire resistant Polyvinylidene Fluoride material conforming to ASTM D3222.

B. Fitting shall be schedule 40 polyvinylidene Fluoride, manufactured to dimension per ASTM F1673. The polyvinylidene Fluoride (PVDF) material shall be fire resistant and conform to ASTM D3311 and F1673.

C. Joining method between the pipe and fittings shall be mechanical joint, meeting ASTM F1673.
D. Approved products

1. Zurn
2. Orion

E. All acid waste lines and fittings shall be insulated with an approved insulation that meets the flame smoke rating for plenum or fire rated rooms or structure. If necessary the insulation shall be wrapped with a plenum rated tape.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Do not calk threaded work.

B. Slope horizontal pipe at \(\frac{1}{4}\) in/ft.

C. Place cleanouts as follows -

1. Where shown on Drawings and near bottom of each stack and riser.
2. At every 90 degree change of direction for horizontal lines.
3. Every 100 feet of horizontal run.
4. Extend cleanout to accessible surface. Do not place cleanouts in carpeted floors. In such locations, use wall type cleanouts.

D. Each fixture and appliance discharging water into sanitary sewer or building sewer lines shall have seal trap in connection with complete venting system so gasses pass freely to atmosphere with no pressure or syphon condition on water seal.

E. Vent entire waste system to atmosphere. Discharge 10 inches above roof. Join lines together in fewest practicable number before projecting above roof. Set back vent lines so they will not pierce roof near edge or valley.

F. Use torque wrench to obtain proper tension in cinch bands when using hubless cast iron pipe. Butt ends of pipe against centering flange of coupling.

*** Roof systems other than concrete roof tile ***

G. Flash pipes passing through roof with galvanized base “no-caulk”, roof flashing with flexible rubber waterproof collar. Flashing base shall be at least 18" x 18".

1. Flashing may be 4 lb per sq ft lead flashing fitted around pipes and turned down into pipe \(\frac{1}{2}\) inch with turned edge hammered against pipe wall.
2. Consult roofing contractor for exact method of flashing, coordinate with engineer.
3.2 FIELD QUALITY CONTROL

A. Before piping is covered, conduct tests for leaks and defective work. Notify Architect prior to testing. Correct leaks and defective work. Fill waste and vent system to roof level with water, 10 feet minimum, and show no leaks for two hours.

END OF SECTION 15412
SECTION 15430 - PLUMBING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -
   1. Furnish and install items specified in this Section and/or described in Contract Documents.

B. Related Sections -
   1. General Conditions, Division 01, and Sections 15010, 15060 and 15190 apply to this Section.

PART 2 - PRODUCTS

2.1 FLOW CONTROL FITTINGS:

A. Vandal proof type and fit faucet spout of fixture used. Flow shall be controlled as required by local codes.

2.2 CONDENSATE DRAINS

A. Provide Type M copper for condensate drains from air handling units, fan coil units, furnace coils, and cooler/freezers. Support piping and protect from damage.

B. Provide schedule 40 PVC for condensate from high tech furnaces, boiler, and water heater.

C. Install 3 inch deep seal, vented water trap adjacent to coil connection.

D. If condensing equipment is installed without a clarifier, the condensate lines shall be PVC pipe and fitting. Secure all piping.

2.3 CONDENSATE PUMP

A. Rated at 225 gph at 15 feet total head. Complete with one gallon polystyrene tank with pump and automatic float control. 1/5 hp, 120 volt, one phase, 60 Hertz.

B. Condensate piping shall be Type M copper.

C. Approved Manufacturers -
   1. Little Giant #VCL45S

2.4 PRESSURE GAUGES

A. Cast aluminum case
B. Chrome plated ring  
C. Clear glass window  
D. Phosphor bronze alloy steel bourdon tube  
E. ½ percent scale range accuracy  
F. 4-1/2 inch diameter dial face  
G. Range 0 to 100 psig.  
H. Liquid Filled.  
I. Approved Manufacturers -  
   1. Trerice 700 or equal  
   2. Crosby-Ashton  
   3. Marsh  

2.5 BRASS GAUGE COCKS  
A. Approved Manufacturers -  
   1. Ashcroft  
   2. Ernst  
   3. Trerice  
   4. Walworth  

2.6 WATER HAMMER ARRESTERS  
A. Provide and install a water hammer arrester at each hot and cold water connection and battery of fixtures.  
B. Water hammer arresters shall be sized in accordance with PDI WH-201, precharged, suitable for operation in temperature range 100 to 300 degrees F, and maximum 250 psig working pressure.  
C. Approved Manufacturers:  
   1. Josam  
   2. J.R. Smith  
   3. Wade  
   4. Zurn  

2.7 THERMOMETERS  
A. 9 inch adjustable, angle, red reading, mercury type with cast aluminum case and 3-1/2 inch chrome-plated brass separable socket.
B.  Range -30 to 240/ F.

C.  Approved Manufacturers

   1.  Trerice BX9 or equal by
        a.  H-B
        b.  Palmer
        c.  Taylor
        d.  Weiss
        e.  Weksler

PART 3 - EXECUTION

3.1  INSTALLATION

   A.  Connect gauges to pipe with ¼ inch connections utilizing cocks.

END OF SECTION 15430
SECTION 15440 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -
   1. Furnish and install plumbing fixtures as described in Contract Documents.

B. Related Sections -
   1. General Conditions, Division 01, and Section 15010 and 15 060 apply to this Section.

PART 2 - PRODUCTS

2.1 GENERAL

A. Interior exposed pipe, valves, and fixture trim shall be chrome plated.

2.2 WATER CLOSETS

A. Standard Fixture -
   1. Approved Manufacturers -
      a. American Standard
      b. Kohler

B. Handicap Fixture -
   1. 18 inch rim height.
   2. Approved Manufacturers
      a. American Standard
      b. Kohler

C. Seat -
   1. Provide split front type with check hinge.
   2. Approved Manufacturers for Standard, Handicapped and Nursery Fixtures -
      a. Church
      b. Beneke Corporation
      c. Bemis
      d. Kohler
      e. Olsonite

D. Supply Pipe & Stop -
   1. Provide stuffing box and chrome plated escutcheons
2. Approved Manufacturers
   a. Eastman
   b. Brass Craft
   c. Dearborn

2.3 LAVATORIES

A. Self-Supporting Fixture –

1. Size 20" x 18"
2. Approved Manufacturers
   a. American Standard
   b. Kohler

B. Fittings -

1. Faucet and Drain -
   a. Approved Manufacturers-
      1) American Standard
      2) Moen Commercial
      3) Symmons
      4) Delta Commercial
      5) Kohler
      6) Zurn

2. Supply pipes with stops -
   a. Provide stuffing box and chrome plated escutcheons.
   b. Approved Manufacturers -
      1) Eastman
      2) Brass Craft
      3) Dearborn
      4) Zurn

3. Trap -
   a. 17 ga tube "P" trap, chrome plated
   b. Approved Manufacturers -
      1) Brass-Craft
      2) Dearborn
      3) McGuire
      4) Keeney Manufacturing
      5) Watts

C. All handicap accessible lavatories shall have traps and hot and cold water supplies insulated with flexible vinyl insulation manufactured by Truebro, Inc. Handi Lav-Gaurd Model No. 102W or No. 105W (no equals accepted).
2.4 HANDICAPPED LAVATORIES

A. Self-Supporting Fixture –

1. Size - 20" x 27"
2. Approved Manufacturers –
   a. American-Standard
   b. Zurn
   c. Kohler

B. Fittings –

1. Faucet & Drain –
   a. Approved Manufacturers –
      1) American Standard
      2) Symmons
      3) Grohe
      4) Moen Commercial
      5) Zurn

2. Supplies with stops
   a. Provide stuffing box, brass stems and chrome plating.
   b. Approved Manufacturers
      1) Eastman
      2) Brass Craft
      3) Dearborn
      4) Zurn

3. Traps
   a. 17 ga tube “P” trap, chrome plated
   b. Approved manufacturers
      1) Watts
      2) Dearborn
      3) McGuire
      4) Keeney Manufacturing

C. All handicap accessible lavatories shall have traps and hot and cold water supplies insulated with flexible vinyl insulation manufactured by Truebro, Inc. Handi Lav-Gaurd Model No. 102W or No. 105W (no equals accepted).

2.5 SERVICE SINK

A. Fixture –

1. Floor Type.
2. Approved Manufacturers –
   a. American Standard
   b. Kohler
B. Fittings -

1. Faucet -
   a. Mounting height of 42 inches
   b. Provide 48 inch hose and clamp.
   c. Approved Manufacturers -
      1) American Standard
      2) Fiat Products Inc
      3) T & S Brass
      4) Kohler
      5) Chicago Faucet

2. Drain and Strainer -
   a. Approved Manufacturers -
      1) American Standard
      2) Zurn
      3) Kohler
      4) Fiat Products, Inc.

3. Trap -
   a. Cast iron - “Deep Seal”.

2.6 STAINLESS STEEL SINKS

A. Fixture -

1. Self-rimming, 18 gauge stainless steel, satin finish.

2. Approved Manufacturers -
   a. One, two or three Compartment -
      1) Elkay

B. Fittings -

1. Faucet and Drains -
   a. One, two or three compartment sinks
   b. Approved Manufacturers
      1) American Standard
      2) Moen Commercial
      3) Kohler

2. Waste -
   a. Approved Manufacturers-
      1) Dearborn
      2) Elkay
      3) Kohler

3. Supply pipes with stops -
   a. Provide stuffing box and chrome plated escutcheons.
b.  Approved Manufacturers -
   1)  Brass Craft
   2)  Dearborn
   3)  Eastman
   4)  Zurn

4.  Trap -
   a.  17 gauge tube "P" trap, chrome plated
   b.  Approved Manufacturers -
       1)  Watts
       2)  Dearborn
       3)  Zurn
       4)  Keeney Manufacturing
       5)  McGuire

2.7  FLOOR DRAINS -

A.  Approved Manufacturers -

   1.  Josam
   2.  J. R. Smith
   3.  Wade
   4.  Zurn
   5.  Watts Drainage Products

2.8  HYDRANTS

A.  Provide with integral anti-siphon device.

B.  Approved Manufacturers (Exterior Frost Free)

   1.  Zurn
   2.  Wade
   3.  J. R. Smith
   4.  Josam
   5.  Woodford
   6.  Watts Drainage Products

C.  Approved Manufacturers (Interior)

   1.  Acorn
   2.  Chicago Faucet
   3.  Woodford

2.9  CLEANOUTS:

A.  Furnish wall cleanouts with chrome wall cover and screw.

   1.  Finish Floors - Wade W-6000
2. Resilient Flooring - Wade W-6000-T
3. Finished Wall - Wade W8460R
4. Exposed Drain Lines - Wade W-8650A
5. General Purpose - Wade W-8550A
6. Approved Alternate Manufacturers for Cleanouts
   a. Josam
   b. Smith
   c. Zurn
   d. Watts Drainage Products

2.10 FLOOR SINK

A. 8 inch square top, medium receptor cast iron body with flanged receptor, acid resistant coated interior, and acid resistant coated half grate. Aluminum sediment bucket and 2 inch calked regular outlet connection.

B. Approved Manufacturers -

   1. Commercial Enameling
   2. JR Smith
   3. Josam
   4. Wade
   5. Zurn
   6. Watts Drainage Products

2.11 WASHING MACHINE OUTLET BOX

A. 16 ga. steel with corrosion resistant epoxy finish.

B. Approved Manufacturers -

   1. Guy Gray Manufacturing, Co., Inc.
   2. Symmons Industries, Inc.

2.12 EMERGENCY EQUIPMENT

A. Drench showers, eye wash.

B. Approved Manufacturers -

   1. Haws
   2. Acorn Safety

2.13 TRENCH DRAIN

A. Approved Manufacturers -

   1. Watts Drainage Products
   2. Wade
   3. J.R. Smith
PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fixtures including traps and accessories with accessible stop or control valve in each hot and cold water branch supply line.

B. Mount fixtures per architectural elevations unless noted otherwise.

C. Make fixture floor connections with approved brand of cast iron floor flange, soldered or caulked securely to waste pipe.

D. Make joints between fixtures and floor flanges tight with approved fixture setting compound or gaskets.

E. Calk between fixtures and wall and floor with white butyl rubber non-absorbent caulking compound. Point edges.

F. All wall hung fixtures shall be securely attached to carriers, fixture hanger or arm shall be supported free of finished wall.

3.2 ADJUSTING, CLEANING

A. Polish chrome finish at completion of Project.

B. Clean sediment from aerators.

END OF SECTION 15440
SECTION 15450 - VIBRATION AND SEISMIC CONTROL FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To:

1. Quality of and requirements for anchorage and seismic restraint systems and vibration isolation systems for HVAC piping and equipment.

B. Related Sections:

1. Section 03 3111: Cast-In-Place Concrete.
2. furnishing and installing of seismic restraint and vibration isolation systems is by installer of equipment requiring such systems. Manufacturers of equipment specified for seismic restraint shall provide product data needed for calculation of seismic restraint needs. This information shall include, but not be limited to, equipment dimensions, dimensioned anchor points, operating weight, and center of gravity dimension.

1.2 REFERENCES

A. American Society For Testing And Materials:

1. ASTM A 615-04b, 'Standard Specification for Deformed & Plain Billet-Steel Bars for Concrete Reinforcement.'

B. Sheet Metal & Air Conditioning Contractors National Association / American National Standards Institute:


1.3 SUBMITTALS

A. Product Data:

1. Restraint system and anchorage method to be used for each piece of equipment.
2. Seismic restraints and calculations for all flexible mounted equipment.
3. Vibration isolators and flexible couplings.
4. Clearly outlined procedures for installing and adjusting isolators, seismic bracing anchors, and snubbers.

B. Shop Drawings:

1. Show size, hanger length, and location of seismic restraints for piping and ductwork.
2. Show details for each isolator and seismic brace with snubbers proposed for specified equipment.
3. Show details for proposed structural steel frames and rails and for anchors to be used in conjunction with isolation of equipment.
4. Show locations of piping and ductwork restraints on installation and fabrication floor plans (not bid set of documents of floor plans), noting size and type of restraint to be used.
5. Show details of supports, hangers, anchorage, and bracing for isolated equipment as designed or proposed by professional engineer employed by Restraint Manufacturer and qualified with seismic experience in bracing for mechanical equipment. Shop drawings submitted for seismic bracing and anchors shall bear engineer's signed professional seal.
6. Include anchor bolt calculations, signed and stamped by registered engineer, showing adequacy of bolt sizing and type.
   a. Calculations shall include anchor embedment, minimum edge distance and minimum center distance.
   b. Design lateral forces shall be distributed in proportion to mass distribution of equipment.
   c. Furnish calculations for anchors on restraint devices, cable, isolators, and on rigidly mounted equipment.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: System design and installation shall meet seismic requirements as defined in 2000 Edition of International Building Code, Section 1621 and applicable state and local codes in accordance with Seismic Zone 2B with minimum restraint capability of .2 g. Explicit requirements and details can be found in referenced SMACNA Manual.

B. Seismic Requirements: Mechanical equipment, piping, and ductwork shall be braced, snubbed, or supported to withstand seismic disturbances and remain operational.

C. Vibration Isolation Requirements: Isolate equipment from structure by means of resilient vibration and noise isolators.

PART 2 - PRODUCTS

PROJECT SPECIFIC: Edit materials list below to include only those materials or elements that are actually part of the Mechanical design.

2.1 MATERIALS

A. Isolation And Seismic Equipment:
   2. Equipment with Fixed Anchor or Support:
      a. Restraint designed according to Sections 1621 and 1622 of International Building Code.
      b. Horizontal force factor for elements of structures:
         1) In addition, vertical force restraint requirement shall be computed at 1/2 value of horizontal forces.
         2) Restrain equipment not anchored directly to floors by cable system designed and furnished by Restraint Manufacturer.
3. Ductwork: Restrain ductwork in accordance with Figures 4.2 to 4.10 in SMACNA Manual as appropriate.

B. Vibration Isolation Requirements:

1. Unless otherwise noted, isolate HVAC equipment one horsepower and over from structure by means of resilient vibration and noise isolators in accordance with ASHRAE HANDBOOK 2003 - HVAC Applications, Table 42, Chapter 47.

2. Design and install isolation equipment, hangers, connections, and other isolating devices to prevent transmission of vibration to structure from equipment and associated piping and ductwork.

3. For floor-mounted equipment, use recommendations of Table 45.

4. For roofs and floors constructed with open web joints, thin long span slabs, wooden construction and unusual light weight construction, evaluate equipment weighing more than 300 pounds to determine additional deflection of structure caused by equipment weight. Isolator deflection shall be 15 times additional deflection or deflection shown in Table 45, whichever is greater.

5. Under-Equipment Spring Isolators:
   a. Equal to Mason SSLFH earthquake motion restrained spring mounts with freestanding stable steel springs, leveling bolts, corrosion resistant finish, motion limiting design, uplift restraining bolts, and 1/4 inch ribbed neoprene noise stop pad.
   b. Isolators shall accept force in any direction up to 1.0 g without failure, and shall limit movement to 3/4 inch 19 mm in any direction.
   c. Springs shall have 50 percent overload capacity.
   d. Size as required to achieve specified static deflection.
   e. Outer diameter of spring proper shall not be less than 0.8 of spring height when in loaded position.

6. Overhead Support Spring And Rubber Hangers:
   a. Combination spring and neoprene hangers.
   b. Hanger bracket shall have 500 percent overload capability and shall allow up to 15 degree hanger rod misalignment without short-circuiting.
   c. Springs shall have 50 percent overload capacity.
   d. Provide seismic bracing as required.

7. Isolate piping and ductwork in mechanical equipment room and piping and ductwork three supports away or 50 feet from other mechanical equipment, whichever is greater, from structure by means of vibration and noise isolators.
   a. Isolate suspended piping with combination spring and fiberglass hangers in supporting rods.
   b. Support floor-mounted piping directly on spring mounts.

8. Isolate vertical pipe risers from structure using vibration and noise isolating expansion hangers having minimum rated deflection of four times anticipated pipe movement. Enclose in housing for fail-safe equipment.

9. Incorporate flexible connectors in piping adjacent to reciprocating equipment.

10. Incorporate flexible connections in ductwork adjacent to air-moving units.
11. Elastomeric Isolator: Neoprene or high quality synthetic rubber with anti-ozone and anti-oxidant additives.
13. Isolators Exposed To Weather: Cadmium plated and neoprene coated springs.

C. Seismic restraint equipment and resilient isolation devices shall be designed and furnished by single Manufacturer:

D. Type One Acceptable Manufacturers:

4. Equal as approved by Architect before bidding. See Section 01 6000.

2.2 FINISHES

A. Clean and paint steel components. Thoroughly clean structural steel bases of welding slag and prime with zinc-chromate or metal etching primer. Etch and paint hot dipped galvanized steel components.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Isolation Equipment:

1. Mount vibration isolated equipment on rigid steel frames or concrete bases unless Equipment Manufacturer certifies direct attachment capability.
2. Install snubbers with factory set clearances.
3. Piping:
   a. Protect isolated and non-isolated piping 2-1/2 inches inside diameter and larger in all planes by restraints to accommodate thermal movement as well as restrain seismic motions.
   b. Locations shall be as scheduled and include, but not be limited to:
      1) At drops to equipment and at flexible connections.
      2) At 45 degree or greater changes in direction of pipe.
      3) At horizontal runs of pipe 30 feet maximum on center spacing.
      4) Gas piping shall have additional restraints as scheduled.

4. Ductwork
   a. Protect isolated and non-isolated rectangular ductwork 4 sq ft in cross-sectional area and larger in all planes by restraints to accommodate thermal movement as well as restrain seismic motion.
   b. Locations shall be determined by Seismic Restraint Manufacturer and include, but not be limited to:
      1) Horizontal runs of ductwork 30 feet maximum on center spacing.
      2) 45 degree or greater changes in direction of ductwork.
      3) Each end of duct runs and drops of equipment.
      4) Each flexible connection.
B. Vibration Isolation: Install piping and ductwork to prevent transmission of noise and vibration into structure.

END OF SECTION 15450
SECTION 15453 - HANDICAP DRINKING WATER COOLING SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -

1. Furnish and install handicap drinking water cooling system as described in Contract Documents.

B. Related Sections -

1. General Conditions, Division 01, and Sections 15010 and 15 060 apply to this Section.

PART 2 - PRODUCTS

2.1 HANDICAPPED FOUNTAIN

A. Vandal proof operating bar on front and both sides. 7-1/2 GPH of 50 deg F water with 90° F room temperature, 1/5 horsepower compressor motor, 120 V, 60 Hz, single phase. One piece stainless steel back splash and basin. Flexi-guard or chrome plated brass bubbler.

B. Approved Manufacturers -

1. Elkay
2. Oasis

PART 3 - EXECUTION

3.1 INSTALLATION

A. Anchor bottom of fountain to wall.

B. Top surface to be 32 inches above floor unless required otherwise by local code.

C. Install 3/8 inch IPS union connection and Chicago No. 376 stop to building supply line.

D. Install 1-1/4 inch IPS slip cast brass "P" trap. Install trap so it is concealed.

END OF SECTION 15453
SECTION 15459 - GAS FIRED STORAGE TYPE WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -
   1. Furnish and install water heater as described in Contract Documents.

B. Related Sections -
   1. General Conditions, Division 01, and Section 15010, 15060 and 15190 apply to this Section.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Glass lined storage tank, pressure tested and rated for 150 psi wp complete with thermostat, high limit control, gas valve, gas pressure regulator, 100% safety shut-off, and draft diverter. AGA approved.

   1. With hand hole cleanout and non-prorated three year tank warranty.
   2. Approved Manufacturers -
      a. A O Smith
      b. Bradford-White
      c. Lochinvar
      d. Rheem
      f. Ruud GL

2.2 ACCESSORIES

A. In seismic zones 3 and/or 4 (UBC Figure 23-2) provide and install anchoring components:
   1. 1" x 18 ga. galvanized steel straps.
   2. #10 x 2-1/2 inch screws.

B. Anchor to wall to resist horizontal displacement due to earthquake motion.

C. Water heaters shall have a Vacuum Breaker and a Thermal Expansion Tank installed on the cold water supply line. Tank shall be of drawn steel construction with a Butyl rubber diagram, plastic lined, and pre-charged with 40 psi air. Maximum working pressure - 150 psi maximum temperature - 200°F. Tank shall be sized as noted on the drawings or as recommended by the manufacturer. Acceptable Manufacturers:
   1. State Industries
   2. Amtrol, Inc.
D. Check valves shall be spring loaded non-slam type, brass construction.

E. Water heater pan shall be aluminum construction and pipe the drain to the nearest floor drain or floor sink.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Water heaters shall each have temperature-pressure relief valve sized to match heat input and set to relieve at 120 psi.

B. Install temperature-pressure relief valve on hot water heater and pipe discharge to directly above funnel of floor drain.

C. Water heaters with heat input above 200,000 btu/hr shall be ASME certified.

D. Factory installed heat trap nipples.

END OF SECTION 15459
SECTION 15481 - COMPRESSED AIR SYSTEM

PART 1 - GENERAL

1.1 SECTION SUMMARY

A. Pipe And Pipe Fittings
B. Reciprocating air compressor.
C. Air receiver and accessories.
D. Aftercooler.
E. Refrigerated air dryer.
F. Pressure reducing station.

1.2 RELATED SECTIONS

A. General Conditions Division 01 and Section 15010, 15060 and 15190.

1.3 SUBMITTALS

A. Submit under provisions of Section 15010.
B. Shop Drawings: Indicate piping system schematic with electrical characteristics and connection requirements.
C. Product Data: Provide manufacturers catalog literature with capacity, weight, and electrical characteristics and connection requirements.
D. Manufacturer's Installation Instructions: Indicate hoisting and setting requirements, starting procedures.

1.4 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 15010.
B. Record actual locations of equipment and components. Modify shop drawings to indicate final locations.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 15010.
B. Operation Data: Submit for air compressor, air receiver and accessories, after cooler, refrigerated air dryer, and pressure reducing station.
C. Maintenance Data: Submit for air compressor, air receiver and accessories, after cooler, refrigerated air dryer, and pressure reducing station.

1.6 REGULATORY REQUIREMENTS

A. Conform to applicable code for installation of pressure vessels.

B. Provide certificate of compliance from authority having jurisdiction indicating approval of air receiver.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site.

B. Accept air compressors, refrigerated air dryer on site in factory fabricated containers with shipping skids and plastic pipe end protectors in place. Inspect for damage.

C. Protect piping and equipment from weather and construction traffic.

1.8 MAINTENANCE MATERIALS

A. Provide maintenance materials under provision of 15010.

B. Provide two quart containers of compressor oil.

PART 2 - PRODUCTS

2.1 MANUFACTURING

A. All pipe & fittings shall be domestic (USA) manufacturer.

B. All valves shall be domestic (USA) manufacturer.

2.2 PIPE AND PIPE FITTINGS

A. Steel Pipe: ASTM A53 or A120, Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234, forged steel welding type.
   2. Joints: Threaded or welded to ANSI B31.1, ANSI B31.9 or ASME Sec. 1.

B. Copper Tubing: ASTM B88, Type L hard drawn.
   2. Joints: ASTM B32, solder, Grade 95TA.
C. Copper Tubing: ASTM B88, Type L annealed.

D. Polyethylene Pipe: ASTM D2153, SDR 11.5.
   1. Fittings: ASTM D2683 or ASTM D2513 socket type.
   3. Confirm use of polyethylene pipe.

2.3 VALVES
A. Ball Valves
   1. Approved Manufacturers:
      a. Nibco
      b. Hammond
      c. Watts
      d. Apollo

B. Swing Check Valves
   1. Approved Manufacturers;
      a. Nibco
      b. Hammond
      c. Watts
      d. Stockham

C. Air Outlets
   1. Approved Manufacturers:
      a. Amflow
   2. Quick Connectors: brass, snap on connector with self-closing valve.

2.4 UNIONS AND COUPLINGS
A. Unions
   1. Ferrous Pipe: 150 psig malleable iron threaded unions.
   2. Copper Tube and Pipe: 150 psig bronze unions with soldered joints.

B. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

C. Flexible Connector: Neoprene with brass threaded connectors.
2.5 COMPRESSOR

A. Approved Manufacturers -

1. Ingersoll-Rand

B. Type: Simplex or Duplex compressor unit as stated on the plans consisting of air cooled compressor, air receiver, after cooler, pressure reducing station, spring isolators, and operating controls.

C. Compressor: Cast iron housing and head, heat treated forged steel or ductile iron shaft, aluminum alloy connecting rods, aluminum pistons with non-lubricated carbon rings, high-strength alloy suction and discharge valves. Statically and dynamically balance rotating parts.

D. Oil Pressure Switch: Equip compressor to automatically shut down compressor in event of oil pressure failure.

E. Capacity Reduction: Section valve unloader with lifting mechanism operated by oil pressure or solenoid valve. Provide for unloaded compressor start.

F. Base: One piece ribbed cast iron or welded steel base for motor and compressor with provision for V-belt adjustment.

G. Capacity as specified on the drawings.

H. Electrical Characteristics as specified on the drawings.

I. Motor: As specified on the drawings. See also Section 15030.

J. Controls:

1. Pressure Switch: Line voltage contactor to break at 100 psi with minimum differential of 200 psi.
2. Compressor Regulation: Lead-lag switch with time delay relay.
3. Electrical Alternation: Operate each compressor for 12 hours. If one compressor fails, second shall automatically maintain air pressure.

K. Wiring Terminations: Provide terminal lugs to match branch circuit conductors quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

L. Disconnect Switch: Factory mount disconnect switch on equipment under provisions of Division 16.

M. Cord and Plug: Provide unit with 6 foot cord and plug for connection to electric wiring system including grounding connector.
2.6 AFTERCOOLER

A. Approved Manufacturers:

1. Ingersoll-Rand
2. Other acceptable manufacturers offering equivalent products.
   a. Amflow
   b. Wilkerson

B. Construction: Removable tube nests of non-ferrous metal tubes and corrosion resistant tube plates, safety valves, pressure gage, moisture separator, moisture drain valve, water inlet piping with automatic water valve, automatic condensate trap and overflow piping with open funnel.


D. Discharge: Cool air to within 12°F (7°C) of ambient air temperature at specified flow capacity.

2.7 AIR DRYER

A. Approved Manufacturers:

1. Amflow
2. Balston
3. Ingersoll Rand
4. Wilkerson

B. Type: Membrane or desiccant filter type capable of removing moisture in compressed air to a pressure dew point of 32°F, with a maximum pressure drop of 5 psig.

2.8 AIR RECEIVER

A. Approved Manufacturers -

1. Ingersoll-Rand
2. Other acceptable manufacturers offering equivalent products.
   a. Champion
   b. Campbell-Hausfeld

B. Receiver: Vertical, built to ASME regulations for working pressure of 125 psi (862kPa). Flange or screw inlet and outlet connections.

C. Fittings: Adjustable pressure regulator, safety valve, pressure gage, drain cock, and automatic float actuated condensate trap.

D. Tank Finish: Shop vinyl.

E. Size as specified on the drawings.
2.9 PRESSURE REDUCING VALVE

A. Approved Manufacturers -

1. Ingersoll-Rand
2. Other acceptable manufacturers offering equivalent products.
   a. Amflow
   b. Wilkerson

B. Pressure Reducing Station: Consisting of automatic reducing valve and bypass, and low pressure side relief and gage. Provide oil separator where indicated.

C. Valve Capacity: Reduce pressure from 200 psi to 30 psi, adjustable upwards from reduced pressure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install compressor unit on 4" concrete housekeeping pad with 45 degrees cambered edges.

C. Install compressor unit on vibration isolators. Level and bolt in place.

D. Make air cock and drain connection on horizontal casing.

E. Install line size ball valve and check valve on compressor discharge.

F. Install replaceable cartridge type filter silencer of adequate capacity for each compressor.

G. Pipe drain to floor drain.

H. Connect condensate drains to nearest floor drain.

I. Install valved bypass around air dryer. Factory insulate inlet and outlet connections.

J. Install valved drip connection at low points of piping system.

K. Install take offs to outlets from top of main, with shut off valve after take off. Slope take off piping to outlets.

L. Install compressed air couplings, female quick connectors, and pressure gages where outlets are indicated.

M. Install tees instead of elbows at changes in direction of piping. Fit open end of each tee with plug.

N. Identify piping system and components.
3.2 FIELD QUALITY CONTROL

A. Compressed Air Piping Leak Test: Prior to initial operation, clean and test compressed air piping in accordance with ANSI B31.1.

B. Repair or replace compressed air piping as required to eliminate leaks, and retest to demonstrate compliance.

C. Cap (seal) ends of piping when not connected to mechanical equipment.

END OF SECTION 15481
SECTION 15489 - NATURAL GAS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -

1. Furnish and install gas piping and fittings within building including connection to meter.

B. Related Sections -

1. General Conditions, Division 01, and Sections 15010, 15060 and 15190 apply to this Section.

1.2 QUALITY ASSURANCE

A. Qualifications -

1. Welders shall be certified and bear evidence of certification 30 days prior to commencing work on project. If there is doubt as to proficiency of welder, Owner's Representative may require welder to take another test. This shall be done at no cost to Owner. Certification shall be by Pittsburgh Testing Laboratories or other approved authority.

PART 2 - PRODUCTS

2.1 MANUFACTURING

A. All pipe & fittings shall be domestic (USA) manufacturer.

B. All valves shall be domestic (USA) manufacturer.

2.2 PIPE

A. Meet requirements of ASTM A 53-89a, "Specification for Pipe, Steel, Black & Hot-Dipped Zinc-Coated Welded & Seamless".

B. Carbon steel, butt welded, Schedule 40 black steel pipe.

2.3 FITTINGS

A. Black Pipe -

1. Welded forged steel fittings meeting requirements of ASTM A 234-89a, "Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures", or standard weight malleable iron screwed.
2.4 VALVES

A. 125 psi bronze body ball valve, UL listed

B. Approved Manufacturers & Models -

1. ConBraCo - "Apollo" series 80-100
2. Jenkins - FIG-30-A
3. Jomar - Model T-204
4. McDonald - 3410
5. PGL Corp - "Red Cap" gas ball valve
6. Watts - Model B-6000-UL

2.5 EARTHQUAKE ACTUATED GAS SHUT-OFF VALVES

A. Aluminum Body Valve.

B. Stainless Steel Ball Shut-off.

C. Manual reset.


E. Approved Manufacturers:

1. Safe-T-Quake.
2. Koso
3. Quakemaster.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Pipe installed underground, through air plenums, in walls, and pipes 2-1/2 inches and larger shall have welded fittings and joints. Other pipe may have screwed or welded fittings.

B. Wrap and lay underground pipe in accordance with local gas utility company regulations and specifications.

C. Install gas cocks on lines serving boilers, furnaces, duct heaters, and water heaters adjacent to boiler, furnace, or heater on outside of boiler, furnace, or heater cabinet and easily accessible.

D. Do not use flexible pipe connections to boilers, furnaces, duct heaters, or hot water heaters.

E. Install dirt leg with pipe cap, 6 inches long minimum, on each vertical gas drop to heating equipment.

F. Use fittings for changes of direction in pipe and for branch runouts.
G. Protection Coatings: All underground steel pipes shall be wrapped with "Scotchrap" NP. 50 tape to give not less than two complete layers on the entire underground piping system. Factory wrapped pipe in accordance with American Water Works Standard, or X-tru-Coast Plastic coated pipe will be acceptable.

H. Paint main gas valve red and label "Main Gas Shut-off" with a permanent label.

I. Install earthquake activated gas shut-off valve downstream of meter before entering building with gas line (required only in seismic zones 3 and 4).

END OF SECTION 15489
SECTION 15530 - REFRIGERANT PIPING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -

1. Furnish and install piping for refrigeration systems as described in Contract Documents.

B. Related Sections -

1. General Conditions, Division 01, and Section 15010 - check all sections, 15060 and 15190 apply to this Section.
2. Section 15263 - Refrigerant piping Insulation

1.2 QUALITY ASSURANCE

A. Qualifications -

1. Refrigerant piping shall be installed by a refrigeration contractor licensed by State.

PART 2 - PRODUCTS

2.1 REFRIGERANT PIPING


B. Do not use pre-charged refrigerant lines.

2.2 REFRIGERANT FITTINGS

A. Wrought copper with long radius elbows.

B. Approved Manufacturers -

1. Mueller Streamline
2. Nibco Inc
3. Grinnell
4. Elkhart Products Corp

2.3 SUCTION LINE TRAPS

A. Manufactured standard one-piece traps.
2.4 CONNECTION MATERIAL

A. Brazing Rods -

1. Copper to Copper Connections -
   a. AWS Classification BCuP-4 Copper Phosphorus (6% silver).
   b. AWS Classification BCuP-5 Copper Phosphorus (15% silver).

2. Copper to Brass or Copper to Steel Connections -
   a. AWS Classification bAg-5 Silver (45% silver).

3. Do not use rods containing Cadmium.

2.5 FLUX

A. Approved Manufacturers -

1. "Stay-Silv white brazing flux" by J W Harris Co
2. High quality silver solder flux by Handy & Harmon

PART 3 - EXECUTION

3.1 INSTALLATION

A. Do not install refrigerant piping underground or in tunnels.

B. Slope suction lines down toward compressor one inch/10 feet. Locate traps at vertical rises against flow in suction lines.

C. Refrigeration system connections shall be copper-to-copper, copper-to-brass, or copper-to-steel type properly cleaned and brazed with specified rods. Use flux only where necessary.

1. No soft solder (tin, lead, antimony) connections will be allowed in system.

D. Braze valve, sight glass, and flexible connections.

E. Circulate dry nitrogen through tubes being brazed to eliminate formation of copper oxide during brazing operation.

3.2 FIELD QUALITY CONTROL

A. Make evacuation and leak tests in presence of Architect's Engineer after completing refrigeration piping systems. Positive pressure test will not suffice for procedure outlined below.

1. Draw vacuum on each entire system with vacuum pump to 300 microns using vacuum gauge calibrated in microns. Do not use cooling compressor to evacuate system nor operate it while system is under high vacuum. Isolate compressor from system piping using shut-off valves prior to pulling vacuum.
2. Break vacuum with Freon to be used and re-establish vacuum test. Vacuum shall hold for 30 minutes at 200 microns without compressor running.
3. Conduct tests at 70° F ambient temperature minimum.
4. Do not run systems until above tests have been made and systems started up as specified. Inform Owner's Representative of status of systems at time of final inspection and schedule start-up and testing if prevented by outdoor conditions before this time.
5. After testing, fully charge system with refrigerant and conduct test with Halide Leak Detector.

END OF SECTION 15530
SECTION 15535 - REFRIGERANT SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including General and Supplementary Conditions and Division-01 Specification sections, apply to work of this section.

B. Section 15010 Basic Mechanical Materials and Methods sections apply to work of this section.

C. Section 15530 - Refrigeration piping

D. Section 15671 - Expansion valves for 2 through 5 ton condensing units

1.2 SUMMARY

A. Includes But Not Limited To

1. Furnish and install refrigeration specialties as described in Contract Documents except for expansion valves on 2 through 5 ton condensing units.

PART 2 - PRODUCTS

2.1 EXPANSION VALVES:

A. For pressure type distributors, externally equalized with stainless steel diaphragm, and same refrigerant in thermostatic elements as in system.

B. Size valves to provide full rated capacity of cooling coil served. Coordinate selection with evaporator coil and condensing unit.

C. Approved Manufacturers

1. Alco
2. Henry
3. Mueller
4. Singer
5. Sporlan

2.2 FILTER-DRIER

A. On lines 3/4 inch outside diameter and larger, filter-drier shall be replaceable core type with non-ferrous casing and Schraeder type valve.

B. On lines smaller than 3/4 inch outside diameter, filter-drier shall be sealed type using flared copper fittings.

C. Size shall be full line size.
D. Approved Manufacturers
   1. Alco
   2. Mueller
   3. Sporlan
   4. Virginia

2.3 SIGHT GLASS
   A. Combination moisture and liquid indicator with protection cap.
   B. Sight glass shall be full line size.
   C. Sight glass connections shall be solid copper or brass, no copper-coated steel sight glasses allowed.

D. Approved Manufacturers
   1. Alco
   2. Asco
   3. Mueller
   4. Sporlan

2.4 MANUAL REFRIGERANT SHUT-OFF VALVE
   A. Ball valves designed for refrigeration service and full line size.
   B. Valve shall have cap seals.
   C. Valves with hand wheels are not acceptable.
   D. Provide service valve on each liquid and suction line at compressor.
   E. If service valves come as integral part of condensing unit, additional service valves shall not be required.
   F. Approved Manufacturers
      1. ConBraCo (Apollo)
      2. Henry
      3. Mueller
      4. Superior
      5. Virginia

2.5 FLEXIBLE CONNECTORS
   A. Provide in each liquid line and suction line at both condensing unit and evaporator on systems larger than five tons.
B. Anchor pipe near each flexible connector.

C. Connectors shall be for refrigerant service with bronze seamless corrugated hose and bronze braiding.

D. Approved Manufacturers
   1. Packless Vibration Absorbers Model VAF
   2. Style "BF" Spring-flex Freon connectors by Vibration Mountings.
   3. Anaconda "Vibration Eliminators" by Anamet.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install valves and specialties in accessible locations. Install refrigeration distributors and suction outlet at same end of coil.

END OF SECTION 15535
SECTION 15611 - GAS FIRED FURNACES (90%)

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -

1. Furnish and install vertical gas-fired condensing furnaces as described in Contract Documents.

B. Related Sections -

1. Section 15010: General Mechanical Requirements
2. Section 15530: Refrigerant Piping System.

1.2 SYSTEM DESCRIPTION

A. Performance Requirements: Rated at 90 percent minimum AFUE (Annual Fuel Utilization Efficiency) calculated in accordance with DOE test procedures.

1.3 SUBMITTALS


1.4 WARRANTY

A. Provide 15-year minimum limited warranty on heat exchanger.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Furnaces:

1. Factory assembled units certified by AGA complete with blower section, steel casing, piped, and wired.
2. Blower section shall consist of cabinet, blower, and motor.
   a. Cabinet shall be of 22 ga minimum cold rolled steel and have finish coat of baked-on enamel.
   b. Blower shall be Class 1, full DIDW, statically and dynamically balanced.
3. Automatic controls shall consist of:
   a. 100 percent cut-off safety pilot.
   c. Operating automatic gas valve.
   d. Solid-state type fan and thermal limit controls.
   e. 24-volt transformer.
   f. Electronic ignition system.
4. Blower shall be driven by motor with adjustable pitch V-belt drive or by multi-speed direct driven motor.
5. Furnace section shall be enclosed in 22 ga minimum enameled steel casing lined with foil covered insulation.
6. Heat exchanger; Aluminized Steel.
8. PVC intake of outside air and PVC combustion product exhaust, with sealed combustion, direct vent system.
9. Concentric roof termination kit for roof mounting.
10. Approved Products:
    a. Two-Stage Furnaces
       1) Carrier 58 MTA/Bryant 352 MAV.
       2) Lennox G61MP.
       3) Trane TUXR.
       4) York P1X.

   B. Cooling Coil

   1. Cooling coil shall consist of heavy gauge steel cabinet with baked-on enamel finish it match furnace.
      a. Coil shall have aluminum fins bonded to seamless copper tubing.
      b. Coil shall be ARI rated. Provide drain pans with connections at one end.
      c. Use thermal expansion valve with brazed joints in place of capillary tube metering device. Compression fittings not acceptable.
      d. Do not include cooling coil and coil cabinet on furnaces serving zones where cooling is not required.

   2. Approved Products:
      a. Vertical:
         1) Carrier/Bryant CK5A.
         2) Lennox C26.
         3) Trane TXC.
         4) York

   2.2 ACCESSORIES

   A. Build 2" thick filter frame external to furnace as detailed on drawings. Provide standard 2" thick size filter.

   B. Vibration Isolators:

   1. Horizontal Installation.
      a. Neoprene hanger type with load of 75 lbs maximum.
      b. Approved Products:
         1) RH by Kinetics Noise Control.
         2) HD by Mason Industries.
         3) RH by Vibration Mounting & Controls.
2. Vertical Installation: 4 inches square by ½ inch thick minimum neoprene type vibration isolation pads.

2.3 MANUFACTURERS

A. Contact Information

1. Carrier Corp, Syracuse, NY (800) 227-7437 or Carrier Canada Ltd/Ltee, Mississauga ON (905) 826-9508.
2. Kinetics Noise Control, Dublin, OH (800) 959-0191 or (514) 889-0480 www.kineticsnoise.com
3. Lennox Industries, Dallas, TX (972) 497-5000 or Lennox Industries (Canada) Ltd. Etobicoke, ON (416) 621-9302.
5. Trane, La Crosse, WI (800) 288-7263.
6. Vibration Mounting & Controls, Bloomingdale, NJ (800) 569-8423 or (973) 838-1780 www.vmc-kdc.com

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install vibration isolator on each hanger rod supporting horizontal furnace and under each corner of vertical furnace.

3.2 FIELD QUALITY CONTROL

A. Manufacturer's Field Service -

1. Furnace distributor's technical service representative shall:
   a. Verify proper gas orifice size.
   b. Clock gas meter for rated input.
   c. Verify and set gas pressure at furnace.
   d. Check and measure temperature rise.
   e. Check safety controls for proper operation.
   f. Check combustion vent sizes and combustion air sizes.

B. In addition, furnace distributor's technical service representative shall start up, check out, and adjust furnaces using equipment check-out sheet provided by Manufacturer. Complete and sign all items on sheet.

END OF SECTION 15611
SECTION 15622 - COMBUSTION AND EXHAUST AIR PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -
   1. Furnish and install heating equipment exhaust piping and combustion air intake piping as described in Contract Documents.

B. Related Sections -
   1. Section 15060: Pipe and pipe fittings
   2. Section 15190: Mechanical Identification

1.2 REFERENCES

A. American Society for Testing and Materials

PART 2 - PRODUCTS

2.1 MATERIALS

A. Air Piping: Schedule 40 pipe and fittings meeting requirements of ASTM D 1785, ASTM D 2661, or ASTM D 2665.

B. Piping Primer and Cement: Meet requirements of ASTM D 2654.

C. Flexible Foamed Pipe Insulation:
   1. Thickness:
      a. ½ inch for 2 through 3 inch outside diameter pipe.
      b. ½ inch sheet for fittings as recommended by Manufacturer.
   2. Approved Products:
      a. Tubalok by Armaflex.
      b. ImcoLock or ImcoShield by IMCOA.
      c. Therma-Cel by Rubatex.
D. Insulation Joint Sealer:

1. Approved products:
   a. 520 by Armaflex.
   b. Construction Adhesive No. 105 by BFG.
   c. 950 Therma-Cel by Rubatex.

2.2 MANUFACTURERS

A. Contact Information:

1. Armaflex by Armacell, Mebane, NC (800) 232-3341. www.armaflex.com
2. BFG industries, West Columbia, SC (800) 845-2220 or (802) 796-1380.
3. IMCOA, Haltom City, TX (800) 535-5078 or (817) 485-5290. www.imcoa.com
4. Rubatex, Roanoke, VA (800) 782-2839 or (540) 561-6000. www.rbxcorp.com

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation For condensing Furnaces:

1. Run individual vent and individual combustion intake piping from each furnace to concentric roof termination kit provided by Furnace manufacturer. Slope lines downward toward furnace.
2. Slop combustion chamber drain downward to funnel drain. Anchor to wall with wall clamps, allowing free movement through clamp for expansion.
3. Use concentric roof termination kit provided by Furnace Manufacturer. Install vent and combustion air intake piping at clearance and distances required by Furnace Manufacturer.
4. Attach factory-supplied neoprene coupling to combustion-air inlet connection and secure with clamp.
5. Ensure that factory-supplied perforated metal disc is installed in flexible coupling, unless its removal is required.

B. Support:

1. Support concentric roof termination kit at ceiling or roof line with 20 ga sheet metal straps as detailed on Drawings.
2. Support horizontal sections of pipe in accordance with requirements of Section 15060. Anchor securely to structure, not allowing pipe to sway.

C. Insulation:

1. General:
   a. Install insulation in snug contact with pipe and in accordance with Manufacturer’s recommendations.
   b. Slip insulation on piping before piping sections and fittings are assembled keeping slitting of insulation to a minimum.
c. Joints:
   1) Place ‘slit’ joint seams of insulation exposed outside building on bottom of pipe.
   2) Stagger joints on layered insulation.
   3) Seal joints in insulation.

d. Paint exterior exposed insulation with two coats of finish recommended by Insulation Manufacturer, color selected by Architect.

2. Install specified insulation on PVC air piping serving mechanical equipment as follows:
   a. Combustion air PVC piping in truss space and in attic.
   b. Combustion vent PVC piping in attic, in truss space, and above roof.
   c. Insulate fittings with sheet insulation and as recommended by Manufacturer.

END OF SECTION 15622
SECTION 15623 - GAS UNIT HEATER

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

A. Gas fired, separated-combustion unit heaters

1. Provide high-efficiency, separated-combustion, gas-fired unit heaters manufactured as Reznor brand units. They are to be designed for fuel use improvement of 25% and engineered for use in building areas with negative pressure and/or extremely dirty of mildly corrosive atmospheres. The use of a factory-installed power venter to draw combustion air from outside is to prevent dirt, line, dust or other contaminants present in the heated space from entering the unit. The combustion air supply pipe and flue exhaust pipe shall be run parallel to a factory supplied (horizontal) (vertical) vent terminal assembly. The terminal assembly shall be concentrically arranged to allow for a single wall or roof penetration.

B. Model UDBS - Centrifugal blower, separated-combustion model

1. Description

a. Each model UDBS series unit shall be equipped for use with (natural) gas and (120/1) volt power supply. The heater shall be equipped with a Thermocore design heat exchanger of aluminized steel. Die-formed, aluminized steel burners include flared ports (burner air shutters) and a stainless steel insert.

1) Controls include a 24-volt control transformer; two-stage gas control system; intermittent spark pilot with electronic flame supervision; fan and limit safety controls; a combustion air pressure differential switch to verify proper vent flow; an open, totally enclosed blower motor with external overloads; and a power venter motor and wheel assembly. Each unit must be able to operate with .24” w.c. of external static pressure. The cabinet is equipped with horizontal louvers and may be equipped with an OSHA-type blower and belt guard and downturn nozzles for directing airflow. The unit is arranged for ceiling suspension with 2-point threaded hanger connections hanger kits.

2) Model UDBS unit heaters are design certified by the American Gas Association and approved by the Canadian Gas Association.
b. The Model UDBS Series gas-fired, blower-type, separated-combustion, power-vented unit heaters are available in sizes ranging from 30,000 to 400,000 BTUH gas input for use with either natural or propane gas, as specified. Model UDBS heaters are designed to separate their combustion air from the air in the heated space. These units are designed and manufactured in accordance with the ANSI definition of “separated combustion”. While discharging exhaust air, the power venter draws in combustion air from the outside atmosphere. Exclusive outside combustion air prevents dirt, lint, dust or other contaminants in the heated space from entering the combustion zone of the heater. This separated combustion heater is designed for use in building areas with negative pressure and/or extremely dirty or mildly corrosive atmospheres. A specially designed combustion air inlet/vent terminal assembly supplied with the Model UDBS8 heater allows for a single building penetration for both exhaust and combustion air.

1) Standard features include a patented Thermocore heat exchanger with a venturi design tube and die-formed burners of aluminized steel with flared ports and a stainless steel burner insert. Standard controls include a single-stage 24-volt gas valve, an intermittent safety pilot with electronic flame supervision, a blower motor with adjustable belt drive, a power venter motor and wheel assembly, a combustion air pressure switch, and a safety limit switch. The blower is capable of handling up to .24” w.c. of external static pressure. Each unit is arranged for field connection to a remote 24-volt thermostat for automatic operation. The heater cabinet is designed for suspension from two 1” couplings.

2) The Model UDBS line of heaters is design-certified by the American Gas Association and approved by the Canadian Gas Association. Each unit displays either an A.G.A. or a C.G.A. label. Model UDBS Series 6 heaters are 80% thermal efficient.

3) WARNING: Gas-fired appliances are not designed for use in hazardous atmospheres containing flammable vapors or combustible dust, or atmospheres containing chlorinated or halogenated hydrocarbons. Installations in public garages or airplane hangars are permitted when in accordance with ANSI Z223.1 and NFPA 54 Codes or CAN1-B149 Codes and enforcing authorities.

NOTE: Regulated combination redundant gas valve consists of combination pilot solenoid valve, electric gas valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff, all in one body. Gas supply pressure must not exceed 0.5 psi (8 oz or 14” w.c.). Minimum inlet pressure for natural gas is 5’ w.c.; minimum inlet pressure for propane gas is 11”w.c.

2. Standard Features
   a. Orifices for natural gas.
   b. Aluminized steel heat exchanger.
   c. Aluminized steel burner with stainless steel insert.
   d. Spark-ignited intermittent safety pilot with electronic flame supervision.
   e. Single-stage combination gas valve.
   f. 115/1/60 supply voltage.
   g. 115/1/60 blower motor with internal thermal overloads.
   h. 115/1/60 venter motor with stainless steel shaft.
   i. Motor contactor (Size 400).
   j. Fan and limit safety controls.
k. ECO drive.
l. Pressure switch to verify vent flow.
m. 24-volt control voltage transformer.
n. Individually adjustable horizontal louvers.
o. Adjustable belt drive blower.
p. Terminal block wiring.
q. Burner Rack side access (pullout drawer; left side facing airstream).
r. 2-point suspension (1" couplings).

3. Optional Features - Factory Installed.
a. Equipped for high altitude.
b. Stainless steel bottom pan.
c. Spark-ignited intermittent safety pilot with electronic flame supervision and timed lockout (required for propane gas).
d. Motor Starter.
e. Manual summer/winter switch.
f. Relay for summer fan operation.
g. OSHA-type belt guard and blower inlet guard.
h. Two-stage natural gas valve.

4. Accessories - Field Installed
a. Horizontal inlet air/vent terminal kit *.
b. Vertical inlet air/vent terminal kit *.
c. Downturn nozzles, 25-60° or variable air deflection range.
d. Manual shutoff valve and union.
e. Thermostats (two stage).
f. Thermostat guard with locking cover.
g. Horizontal inlet air/vent terminal kit.

1.2 WARRANTY

A. Reznor Product Limited Warranty

1. Thomas & Betts Corporation warrants to the original owner-user that this Reznor product will be free from defects in material or workmanship. This warranty is limited to twelve (12) months from the date of original installation, whether or not actual use begins on that date, or eighteen (18) months from date of shipment by Thomas & Betts Corporation, whichever occurs first.

2. Limitations and Exclusions
a. Thomas & Betts Corporation’s obligation under this warranty is limited to repair or replacement at its manufacturing facility of any part or parts of this Reznor product identified by model or serial number which shall be returned to Thomas & Betts Corporation with transportation charges prepaid and which the manufacturer’s examination shall disclose to its satisfaction to be defective. Reznor parts or products will not be accepted at the manufacturing facility without an attached Return materials Tag. Repaired or replacement parts will be shipped by the Thomas & Betts Corporation facility, F.O.B. shipping point.

1) This warranty does not cover labor or other costs incurred in repairing, removing, installing, servicing, or handling of parts or complete products.
2) This warranty will not apply if the input to the product exceeds the rated input as indicated on the nameplate by more than 5%, or if the product in the judgement of the manufacturer has been subjected to misuse, negligence, accident corrosive atmospheres, atmospheres containing any contaminant (silicone, aluminum oxide, etc), excessive thermal shock, physical damage, impact, abrasion, unauthorized alterations, or operation contrary to the manufacturer’s printed instructions, or if the serial number has been altered, defaced or removed.

3) Thomas & Betts Corporation shall not be liable for any default or delay in performance of its warranty obligations hereunder caused by any circumstances beyond its control, including but not limited to judicial or government restrictions or restraints, strikes, fires, floods, or reduced supplies of raw materials, energy, or parts.

END OF SECTION 15623
SECTION 15625 - MAKE-UP AIR UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -

1. Furnish and install make-up units as described in Contract Documents.

B. Related Sections -

1. General Conditions, Division 01, and Section 15010 apply to this Section.
2. Section 15887 - Filters

PART 2 - PRODUCTS

2.1 SUMMARY

A. Make-up Air Units

1. Cabinets -
   a. Constructed by galvanized steel with protective enamel on zinc coated finish, adequately braced and reinforced, and of sectionalized construction.
   b. Panels shall be removable for easy access to interior of unit.
   c. With interior mounted motors, hinged access doors with cam locks.
   d. Cabinet panels shall be internally insulated with one inch thick, 3/4 lb density, vinyl coated glass fiber insulation.
   e. Seal joints with permanent type flexible mastic.

2. Provide insulated drain pan with condensate connections at each end. Extend drain pan under coil headers and refrigerant distributors. plus unused ends.

3. Fans -
   a. Double inlet, double width, forwardly curved centrifugal type designed for Class I operation.
   b. Base fan ratings on tests conducted in accordance with AMCA Code #210.
   c. Construct fan housings with streamline inlet and side sheets.
   d. Fans shall be statically and dynamically balanced and tested. Maximum rated fan RPMs shall be well below first critical fan shaft speed.


5. Bearing -
   a. Self-aligning, grade lubricated, ball type, and sized minimum service factor of 4.
   b. Provide lubrication fittings. Permanently lubricated bearings are not acceptable.
   c. Provide extended lubrication lines to accessible side of unit.

6. Rate V-belt drives at 150% of motor rating.
   a. Motor sheaves shall be of adjustable pitch type giving 30% speed variation.
b. Fabricate belt guards from 16 gauge galvanized steel rigidly supported.
c. Provide 1-1/2 inch diameter tachometer holes for both fan and motor shafts.

7. Motors -
a. As described in Contract Documents and mounted on rubber isolated base incorporating a device for belt tightening, or internal to unit with fan, motor, and drive assembly internally isolated.

8. Burner & Heat Exchanger -
b. Gas Burner: Atmospheric type with adjustable combustion air supply, combination gas valve and pressure regulator incorporate manual shut-off, automatic 100 percent shut-off and thermo-couple pilot safety device, and electronic pilot ignition.
c. Gas Burner Safety Controls: Thermo-couple sensor prevents opening of solenoid gas valve until pilot flame is proven and stops gas flow on ignition failure.
d. Duct Thermostat: Cycles burner to maintain discharge air temperature setting.
e. High Limit Control: Fixed stop at maximum permissible setting, de-energized burner on high bonnet temperature and re-energizes when temperature drops to lower value.
f. Duct Thermostat: Shall be low voltage, to control burner operation, heater modulates to maintain temperature setting.
g. Separated combustion intake.

9. Filter -
a. Provide with hinged access doors and quick release locking handles.
b. Provide end fillers as necessary to prevent by-passing of air.
c. Provide one inch wide 16 gauge galvanized steel filter removal strap with one end bent up on inch to form hook.

10. Approved Manufacturers -
a. Trane
b. Modine
c. Reznor
d. Hastings
e. Sterling
f. Rupp Air

2.2 ACCESSORIES

A. Roof

1. Curb shall be fully welded. PART 3 - EXECUTION

3.1 INSTALLATION

A. Set units on manufacture fully welded curbs.
3.2 FIELD QUALITY CONTROL

A. Manufacturer's Field Service -

1. Equipment Contractor to provide start-up service.

END OF SECTION 15625
SECTION 15640 - FLUES

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -
   1. Furnish and install flues as described in Contract Documents.

B. Related Sections -
   1. General Conditions, Division 01, and Section 15010 apply to this Section.
   2. Division 09 - Painting

PART 2 - PRODUCTS

2.1 FLUES

A. Double wall, prefabricated sectional type 'B', of aluminum construction designed to handle combustion products of fuel being used. Provide with inspection cap as required by local code, roof flashing, and clean-out.

   1. Height of flue above roof shall be as shown on Drawings unless local code requires it be higher.
   2. Size and install flues from furnaces according to local codes except as follows -
      a. No vertical flue shall have an area of less than 12-1/2 sq inches (4 inches round).
      b. In no case shall vent connector from furnace be smaller than outlet collar provided by Manufacturer.
   3. Every portion of flue connector shall have rise of one inch per ft minimum from appliance to vertical flue.
   4. Length of horizontal flues or flue connectors shall not be longer than 75% of height of vertical flue between point at which horizontal flue enters vertical flue to top of vertical flue. In no case shall horizontal run exceed 15 feet.
   5. When two or more flue connections enter common vertical flue, smaller flue connector shall enter at a higher level. Do not enter flue connectors in same horizontal plane.
   6. Horizontal flue connectors shall be double wall.
   7. Fittings shall be pre-fabricated double wall.
   8. Every gas appliance flue shall have a "backdraft preventer" installed at top of flue.

B. Approved Manufacturers -

   1. Ameri-Vent
   2. Dura-Vent
   3. Metalbestos
2.2 VENT CAPS

A. Non-backdraft type for installation on top of flue, aluminum construction.

B. Approved Manufacturers -

1. Ameri-cap
2. Breidert Type L
3. Triangle AFL
4. Acme Mastervent Type MVR.
5. Dura-Vent

END OF SECTION 15640
SECTION 15647 - ELECTRIC RADIANT WALL AND CEILING HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -
   1. Furnish and install wall heaters as described in Contract Documents.

B. Related Sections -
   1. General Conditions and Division 01 apply to this Section.

1.2 QUALITY ASSURANCE

A. Units shall be UL listed and comply with NEC. PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Fan type for recess mounting in wall.

B. 20 gauge minimum sheet metal casing.

C. Heating element shall be encased in steel finned casting and protected by thermal switch.

D. Fan motor shall be heavy duty enclosed and permanently lubricated.

E. Fan shall be precision balanced and fan-motor assembly mounted to be vibration free.

F. Units shall be controlled automatically by integral thermostat when heater is in "ON" position.

G. Heater shall have built-in fan delay.

H. Finish - Baked-on enamel.

I. Approved Manufacturers -
   1. Q' Mark
   2. Berko
   3. Markel

PART 3 - EXECUTION (NOT USED)

END OF SECTION 15647
SECTION 15675 - AIR-COOLED HEAT PUMP UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -

1. Furnish and install heat pump units as described in Contract Documents.

B. Related Sections -

1. General Conditions, Division 01, and Section 15010 apply to this Section.
2. Division 03 - Concrete slab

1.2 SUBMITTALS

A. Warranty -


1.3 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies -

1. Each unit shall be UL labeled.

1.4 WARRANTY

A. Five-year warranty on compressors.

1. Warranty time frame shall be five years from date of "start-up". "Start-up" date shall be recorded on warranty certificate for each unit.

PART 2 - PRODUCTS

2.1 ONE AND A HALF TON THROUGH FIVE TON UNITS

A. Heat pump coil shall have aluminum plate fins mechanically bonded to seamless copper or aluminum tubes.

1. Provide coil guard for unit.

B. Fans shall be direct driven propeller upflow type.

1. Fan motor shall be single or two speed, thermostatically controlled, permanently lubricated, and designed with permanent protection.
2. Motors shall be resiliently mounted.
3. Each fan shall have a safety guard.
C. Units shall be operable down to 15° F outdoor temperature.

D. Compressor shall be of hermetic design with the following features. Each heat pump unit shall have only one compressor.
   1. Externally mounted brass service valves with charging connections.
   2. Crankcase heater.
   3. Resilient rubber mounts.
   5. Single speed
   6. Reversing valve.

E. Controls -
   1. Factory wired and located in separate enclosure.
   2. Safety devices shall consist of high and low pressure cutout and condenser fan motor overload devices.
   3. Unit shall have anti-cycle timers to prevent units from starting up again for five minutes after any power interruption.

F. Casing -
   1. Fully weatherproof for outdoor installation. Finish shall be weather resistant.
   2. Openings shall be provided for power and refrigerant connections.
   3. Panels shall be removable for servicing.

G. Expansion Valves -
   1. Stainless steel diaphragm and same refrigerant in thermostatic elements as in system. Externally or internally equalized as required by evaporator/heat pump system.
   2. Size valves to provide full rated capacity of cooling coil served.
   3. Furnished by evaporator coil/heat pump unit supplier and coordinated to provide bleed holes for system pressure equalization, if required.

H. Heat pump units shall use R410A refrigerant.

I. Only one liquid line, one suction line, and one power connection shall be made to each compressor. Provide charging valves.

J. EER rating as defined by ARI shall be not less than 13.0.

K. Set each unit on neoprene isolation pads located at each corner and sized 4" x 4" x 3/4" high minimum.

2.2 APPROVED MANUFACTURERS

A. Bryant

B. Carrier
C. Day & Night
D. Lennox
E. Payne
F. Trane

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set heat pump units on concrete slab.

3.2 FIELD QUALITY CONTROL

A. Manufacturer's Field Service -

1. Heat pump units shall be started up, checked out, and adjusted by Heat Pump Unit Manufacturer's authorized factory trained service mechanic.
2. Mechanic shall use check-out sheet provided by Manufacturer, complete and sign all items on sheet, and submit to Architect.

END OF SECTION 15675
SECTION 15869 - EXHAUST FANS

PART 1 - GENERAL

1.1 SUMMARY
   A. Includes But Not Limited To -
      1. Furnish and install exhaust fans as described in Contract Documents.
   B. Related Sections -
      1. General Conditions, Division 01, and Section 15010 apply to this Section.

1.2 QUALITY ASSURANCES
   A. Requirements of Regulatory Agencies -
      1. Bear AMCA seal and UL label. PART 2 - PRODUCTS

2.1 CEILING MOUNTED EXHAUST FANS
   A. Acoustically insulated housings.
   B. Include shatterproof integral back-draft damper with no metal to metal contact.
   C. True centrifugal wheels.
   D. Entire fan, motor, and wheel assembly shall be easily removable without disturbing housing.
   E. Suitably ground motors and mount on rubber-in shear vibration isolators.
   F. Provide wall or roof cap, as required.
   G. Approved Manufacturers -
      1. Cook-Gemini
      2. Greenheck Sp
      3. Panasonic
      4. Acme

2.2 INLINE FAN
   A. Duct mounted supply, exhaust or return fans shall be of the centrifugal, direct driven or belt driven in-line type.
   B. The fan housing shall be of the square design, constructed of heavy gauge galvanized steel and shall include square duct mounting collars.
C. Fan construction shall include two removable access panels located perpendicular to the motor mounting panel. The access panels must be of sufficient size to permit easy access to all interior components.

D. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.

E. Motors shall be permanently lubricated and carefully matched to the fan loads. Motors shall be readily accessible for maintenance.

F. A NEMA 1 disconnect switch shall be provided as standard. Factory wiring shall be provided from motor to the handy box.

G. All fans shall bear the AMCA Certified Ratings Seal for both sound and air performance.

H. Each fan shall bear a permanently affixed manufacturer’s nameplate containing the model number and individual serial number for future identification.

I. Motors in the airstream shall have fan wheel mounted to motor shaft and support for weight. Motors and drives that are mounted out of the airstream shall provide the following:
   1. Drives shall be sized for a minimum of 150% of driven horsepower.
   2. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.
   3. Motor pulleys shall be adjustable for final system balancing.

J. Approved Manufacturers -
   1. Acme
   2. PennBarry
   3. Cook
   4. Greenheck
   5. Twin City
   6. Carnes

PART 3 - EXECUTION

3.1 INSTALLATION
   A. Anchor fan units securely to structure or curb.

END OF SECTION 15869
SECTION 15887 - DISPOSABLE FILTERS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -
   1. Furnish and install filters used in air handling units.

B. Related Sections -
   1. General Conditions and Division 01 apply to this Section.
   2. Filters other than in air handling units specified in Sections specifying equipment in which filters are installed.

PART 2 - PRODUCTS

2.1 AIR HANDLING UNIT FILTERS

A. 2 inch thick, medium efficiency, standard size, disposable type pre-formed pleated design, having at least 4.5 sq ft of filtering media per sq ft of face area.

B. Media shall be reinforced non-woven cotton fabric, treated with adhesive similar to "Vyclad B" and continuously laminated to supporting steel wire grid conforming to configuration of pleats.

C. Media pack shall be sealed in a chipboard frame or beverage board.

D. Filters shall have rated average efficiency of 30 to 35% on ASHRAE Test Standard 52-76 and MERV 8 with 3.0 to 10.0 µm partial size arrestive and be capable of operating with variable face velocities up to 500 FPM without impairing efficiency.

E. Initial resistance shall not exceed 0.30 inches w.g. at 500 FPM or 0.14 inch w.g. at 300 FPM. Filter shall be listed Class 2 by UL.

F. Approved Manufacturers -
   1. Type 30/30 by Farr Co
   2. Mark 80 by Serv-Aire
   3. HC Type 40 by Envopleat
   4. DP2-40 by Air Guard

END OF SECTION 15887
SECTION 15890 - LOW-PRESSURE STEEL DUCTWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -
   1. Furnish and install above-grade ductwork and related items as described in Contract Documents.

B. Related Sections -
   1. General Conditions, Division 01, and Section 15010 apply to this Section.
   2. Section 15010 - Smoke testing
   3. Section 15970 - Temperature control damper actuators and actuator linkages

PART 2 - PRODUCTS

2.1 DUCTS


B. Use of aluminum, non-metallic, or round ducts is permitted only when shown on plans.

2.2 DUCT JOINTS

A. Ducts with sides up to and including 36 inches shall be fabricated using SMACNA T-1 and T-3 joints.

B. Duct sizes over 36 inches shall be fabricated using SMACNA T-24 flange joints or pre-fabricated systems as follows -
   1. Ducts with sides over 36 inches to 48 inches -
      a. Transverse duct joint system by Ductmate/25, Nexus, or WDCI (Lite) (SMACNA “E” or “G” Type connection).
      b. Approved Manufacturers -
         1) Ductmate Industries Inc., 10760 Bay Meadows Drive, Sandy, UT 84092 (801) 571-5308; Stockton, CA (800) 344-3270 - Pittsburgh, PA (800) 245-3188
         2) Nexus, Exanno Corp., P.O. Box 729, Buffalo, NY 14206 (714) 849-0545
         3) WDCI, P.O. Box 10868, Pittsburgh, PA 15236 (800) 248-2355.

   2. Ducts 48 inches & larger -
      a. Ductmate/35, Nexus, or WDCI (Heavy) (SMACNA “J” Type connection).
b. Approved Manufacturers -
   1) Ductmate Industries Inc., 10760 Bay Meadows Drive, Sandy, UT 84092 (801) 571-5308; Stockton, CA (800) 344-3270 - Pittsburgh, PA (800) 245-3188
   2) Nexus, Exanno Corp., P.O. Box 729, Buffalo, NY 14206 (714) 849-0545
   3) WDCI, P.O. Box 10868, Pittsburgh, PA 15236 (800) 248-2355.

2.3 ACCESS DOORS IN DUCTS

   A. At each manual outside air damper and at each motorized damper, install factory built insulated access door with hinges and sash locks. Locate doors within 6 inches of installed dampers.

   B. Fire damper access doors shall have a minimum clear opening of 12" x 12" or as specified on Drawings to easily service fire damper. Doors shall be within 6 inches of fire dampers and in Mechanical Room if possible. Each fire or fire/smoke damper access door shall be labeled with \( \frac{1}{2} \)" in height and read “Fire Damper” or “Fire Smoke Damper”.

   C. Approved Manufacturers -

      1. AirBalance - Fire/Seal #FSA 100
      2. Air Control Products - HAD-10
      3. Cesco-Advanced Air - HAD-10
      4. Ductmate Industries Inc - “Sandwich” access door
      5. Kees Inc - ADH-D.
      6. Louvers & Dampers - #SMD-G-F
      7. Nailor-Hart Industries Inc. - Series 0831
      8. National Controlled Air Inc - Model AD-FL-1

2.4 ACCESS DOORS IN CEILINGS

   A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications Section, apply to this section.

   B. This Section includes access doors for installation in the following types of construction:

      1. Gypsum drywall.

   C. Provide fire-rated access doors.
D. SUBMITTALS:

1. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
   a. Product data in form of manufacturer’s technical data and installation instructions for each type of access door assembly, including setting drawings, templates, instructions, and directions for installation of anchorage, devices
   1) Include complete schedule, including types, general locations, sizes, wall and ceiling construction details, finishes, latching or locking provisions, and other data pertinent to installation.

E. Single-Source Responsibility: Obtain access doors for entire project from one source from a single manufacturer.

F. Fire-Resistance Ratings: Wherever a fire-resistance classification is indicated, provide access door assembly with panel door, frame, hinge, and latch from manufacturer listed in Underwriters Laboratories, Inc.’s “Building Materials Directory” for rating shown.

1. Provide UL label on each fire-rated access door.

G. Size Variations: Obtain Engineer’s acceptance of manufacturer’s standard size units, which may vary slightly from size indicated. Figure 24 x 24 during bid, if no size is given.

H. Coordination: Furnish inserts and anchoring devices that must be built into other work for installation of access doors. Coordinate delivery with other work to avoid delay.

I. Verification: Examine the plans for all fire and fire/smoke dampers and concealed equipment. The contractor is responsible for providing fire rated or non rated as need requires.

J. Manufacturers: Subject to compliance with requirements, provide access doors by one of the following:

1. J.L. Industries
3. Milcor, Inc.
4. Nystrom, Inc.
5. The Williams Brothers Corp.

K. General: Furnish each access door assembly manufactured as an integral unit, complete with all parts, and ready for installation.

L. Steel Access Doors and Frames: Fabricate units of continuous welded steel construction unless otherwise indicated. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of support shown.
M. Frames: Fabricate from 16-gage steel.
   1. Fabricate frame with exposed flange nominal 1-inch wide around perimeter of frame for units installed in the following construction:
      a. Drywall finish.
   2. For gypsum drywall, furnish perforated frames with drywall bead.

N. Flush Panel Doors: Fabricate from not less than 14-gage sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175°. Finish with manufacturer's factory-applied prime paint.
   1. For fire-rated units, provide manufacturer's standard insulated flush panel/doors, with continuous piano hinge and self-closing mechanism.

O. Locking Devices: Furnish flush, screwdriver-operated cam locks of number required to hold door in flush, smooth plane when closed.
   1. Provide one cylinder lock per access door. Furnish 2 keys per lock. Key all locks alike, unless otherwise scheduled.

P. Comply with manufacturer's instructions for installation of access doors.

Q. Coordinate installation with work of other trades.

R. Adjust hardware and panels after installation for proper operation.

S. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

2.5 FLEXIBLE EQUIPMENT CONNECTIONS

A. 30 oz closely woven UL approved glass fabric, double coated with neoprene.

B. Fire retardant, waterproof, air-tight, resistant to acids and grease, and withstand constant temperatures of 250° F.

C. Approved Manufacturers -
   1. Cain - N-100
   2. Duro Dyne - MFN
   3. Ventfabrics - Ventglas

2.6 CONCEALED CEILING DAMPER REGULATORS

A. Approved Manufacturers -
   1. Cain
   2. Duro Dyne
   3. Metco Inc
   4. Vent-Lock - #666
5. Young - #303

2.7 VOLUME DAMPERS

A. In Main Ducts -

1. 16 gauge galvanized steel, opposed blade type with 3/8 inch pins and end bearings. Blades shall have 1/8 inch clearance all around.
2. Damper shall operate within acoustical duct liner.
3. Provide channel spacer equal to thickness of duct liner.
4. Approved Manufacturers -
   a. Air Balance - Model AC-2
   b. Air Control Products - CD-OB
   c. American Warming - VC-2-AA
   d. Greenheck - VCD-1100
   e. Safe-air - Model 610
   f. Vent Products - 5100

B. In Sheet Metal Branch Ducts -

1. Extruded aluminum, opposed blade type. When in open position, shall not extend beyond damper frame.
2. Maximum blade length 12 inches.
3. Damper Regulator shall be concealed type with operation from bottom or with 90 degrees miter gear assembly from side.
4. Approved Manufacturers -
   a. Air Control Products - TCD-OB
   b. Air Guide - OB
   c. Air-rite - Model ST-3
   d. Arrow - OBDAF-207
   e. Reliable Metals - OBD-RO
   f. Safe-air - Models BDR, 612
   g. Tuttle & Bailey - A7RDDM
   h. Young - 820-AC

C. Dampers above removable ceiling and in Mechanical Rooms shall have locking quadrant on bottom or side of duct. Otherwise, provide concealed ceiling damper regulator and cover plate.

2.8 MOTORIZED OUTSIDE AIR DAMPERS

A. Damper Blades -

1. 18 gauge galvanized steel or equivalent aluminum with replaceable rubber blade edges, 9 inches wide maximum.
2. End seals shall be flexible metal compression type.
3. Opposed blade type.

B. Make provision for damper actuators and actuator linkages to be mounted external of air flow.
C. Approved Manufacturers & Models -

1. American Warming - VC-2-AAVA
2. Arrow - OBDAF-207
3. Greenheck - VCD-2100
4. Honeywell - D641
5. Johnson - D1300
6. Louvers & Dampers - TSD400
7. Ruskin - CD36 or CD60
8. Vent Products - 5800

2.9 BACKDRAFT DAMPER

A. Backdraft blades shall be nonmetallic and shall be neoprene coated fiberglass.

B. Stop shall be galvanized steel screen or expanded metal, ½ inch mesh.

C. Frame shall be galvanized steel or extruded aluminum alloy.

D. Approved Models & Manufacturers -

1. Air Control Products - FBD
2. American Warming - BD-15
3. Ruskin - NMS2

2.10 DUCT HANGERS

A. 1" x 18 gauge galvanized steel straps or steel rods shall comply with UMC and SMACNA or as detailed on drawings, and spaced not more than 8 feet apart. Do not use wire hangers.

B. Attaching screws to wood trusses shall be 1-1/2 inch No. 10 round head wood screws. Nails not allowed.

C. Attaching to steel structures shall be C-Clamp.

2.11 DUCT SEALER

A. Cain - Duct Butter or Butter Tak

B. Design Polymeric - DP 1010

C. DSC - Stretch Coat

D. Duro Dyne - S2

E. Hardcast - #601 Iron-Grip or Peel-N-Seal Tape

F. Kingco - 15-325
3.1 INSTALLATION

A. Ducts -

1. Straight and smooth on inside with joints neatly finished unless otherwise directed.
2. Duct panels through 48 inch dimension having acoustic duct liner need not be crossbroken or beaded.
3. Crossbreak unlined ducts and duct panels larger than 48 inch or bead 12 inches on center.
4. Securely anchor ducts to building structure with specified duct hangers attached with screws or C-clamps.
5. Brace and install ducts so they shall be free of vibration under all conditions of operation.
6. Ducts shall not bear on top of structural members.
7. Make duct take-offs to branches, registers, grilles, and diffusers as detailed on Drawings.
8. Ducts shall be large enough to accommodate inside acoustic duct liner. Dimensions shown on Drawings are net clear inside dimensions after duct liner has been installed.
10. Install internal ends of slip joints in direction of flow. Make joints air tight using specified duct sealer.
11. Cover horizontal and longitudinal joints on exterior ducts with two layers of Hardcast tape installed with Hardcast HC-20 adhesive according to Manufacturer's recommendations.
12. Paint ductwork visible through registers, grilles, and diffusers flat black.

B. Each access door shall have a label with letters no less than \( \frac{1}{2} \)” in height reading "Fire Damper".

C. Install flexible inlet and outlet duct connections to each furnace, fan, fan coil unit, and air handling unit.

D. Install concealed ceiling damper regulators.

1. Paint cover plates to match ceiling tile.
2. Damper regulators will not be required for dampers located directly above removable ceilings or in Mechanical Rooms.

E. Provide each take-off with an adjustable volume damper to balance that branch.

1. Anchor dampers securely to duct.
2. Install dampers in main ducts within insulation.
3. Dampers in branch ducts shall fit against sheet metal walls, bottom and top of duct, and be securely fastened. Cut duct liner to allow damper to fit against sheet metal.
4. Where concealed ceiling damper regulators are installed, provide a cover plate.

F. Install grilles, registers, and diffusers. Level floor registers and anchor securely into floor.

G. Air Turns -

1. Permanently installed, consisting of single thickness curved metal blades or vanes arranged to permit air to make abrupt turn without appreciable turbulence, in 90 degree elbows of above ground supply and return ductwork.
2. 4-1/2 inch wide minimum vane rail. Do not use junior vane rails.
3. Quiet and free from vibration when system is in operation.

3.2 TESTING FOR LEAKAGE:

A. General: After each duct system is completed, test for duct leakage in accordance with SMACNA “High Pressure Duct Standards–3rd Edition, Chapter 10–Testing for Leakage”. Repair leaks and repeat tests until total leakage is less than 1% of system design air flow.

END OF SECTION 15891
SECTION 15892 - NON METAL DUCTWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -

1. Furnish and install supply air branch duct runouts to diffusers as described in Contract Documents.

B. Related Sections -

1. General Conditions, Division 01, and Section 15010 apply to this Section.
2. Section 15 891 - Volume dampers and sheet metal ducts

PART 2 - PRODUCTS

2.1 DUCTS

A. Formable, flexible, circular duct which shall retain its cross-section, shape, rigidity, and shall not restrict air flow after bending.

B. Nominal 1-1/2 inches thick, 3/4 lb/cu ft density fiberglass insulation with air-tight, polyethylene or polyester core, sheathed in seamless foil vapor barrier jacket factory installed over flexible assembly.

C. Assembly, including insulation and vapor barrier, shall meet Class I requirement of NFPA 90A and be UL 181 rated, with flame spread of 25 or less and smoke developed rating of 50 or under.

2.2 APPROVED MANUFACTURERS

A. ANCO-FLEX

B. Flex-Aire - PF/UPC

C. Flexible Air Movers Inc

D. Thermaflex

E. Codywest - Type NIL-M

F. Flex Master - Type 8M
PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct in fully extended condition free of sags and kinks, using four foot maximum lengths. Ductwork shall not be used for 45° to 90° elbows.

B. Make duct connections by coating exterior of duct collar for 3 inches with duct sealer and securing duct in place over sheet metal collar with ½ inch wide metal cinch bands and sheet metal screws.

END OF SECTION 15892
SECTION 15896 - DUCT LINING

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -

1. Furnish and install, as described in Contract Documents, acoustical lining of -
   a. Above ground metal ductwork including fresh air, supply air, return air, mixed air, transfer air, relief air and exhaust air. Combustion air ducts are not included.
   b. Elbows, fittings, and diffuser drops.

B. Related Sections -

1. General Conditions, Division 01, and Section 15010 apply to this Section.
2. Section 15290 - External thermal duct insulation.

1.2 SYSTEM DESCRIPTION

A. Duct dimensions shown on Drawings are for free area inside insulation.

PART 2 - PRODUCTS

2.1 DUCT LINER

A. 1½ inch thick, 1-1/2 lb density fiberglass. (R-6.2) minim shall meet ASTM 1071 for air velocity and ASTM 1338 for microbial growth.

B. Approved Manufacturers -

1. CSG - Ultralite
2. Knauf - Type E-M
3. Manville - Lina-Coustic
4. Owen Corning Fiberglas - Aeroflex

2.2 ADHESIVE

A. Water Base Type -

1. Cain - Hydrotak
2. Duro Dyne - WSA
3. Kingco - 10-568
4. Miracle - PF-101
5. Mon-Eco - 22-67
6. Techno Adhesive - 133

B. Solvent Base (non-flammable) Type -

1. Cain - Safetak
2. Duro Dyne - FPG  
3. Kingco - 15-137  
4. Miracle - PF-91  
5. Mon-Eco - 22-24  
6. Techno Adhesive - 'Non-Flam' 106  

C. Solvent Base (flammable) Type -  
1. Cain - HV200  
2. Duro Dyne - MPG  
3. Kingco - 15-146  
4. Miracle - PF-96  
5. Mon-Eco - 22-22  
6. Techno Adhesive - “Flammable” 106  

2.3 MECHANICAL FASTENERS  
A. Approved Manufacturers -  
1. AGM Industries Inc - "DynaPoint" Series DD-9 pin  
2. Cain  
3. Duro Dyne  
4. Omark dished head "Insul-Pins"  
5. Grip nails may be used if each nail is installed by "Grip Nail Air Hammer" or by "Automatic Fastener Equipment" in accordance with Manufacturer's recommendations.  

PART 3 - EXECUTION  
3.1 INSTALLATION  
A. Install mat finish surface on air stream side. Secure insulation to cleaned sheet metal duct with continuous 100% coat of adhesive and with 3/4 inch long mechanical fasteners 12 inches on center maximum unless detailed otherwise on Drawings. Pin all duct liner.  
B. Accurately cut liner and thoroughly coat ends with adhesive. Butt joints tightly. Top and bottom sections of insulation shall overlap sides. If liner is all one piece, folded corners shall be tight against metal. Ends shall butt tightly together.  

3.2 FIELD QUALITY CONTROL  
A. If insulation is installed without longitudinal and end joints butted together, installation will be rejected and work removed and replaced with work that conforms to this Specification.  

3.3 ADJUSTING, CLEANING  
A. Keep duct liner clean and free from dust. At completion of project, vacuum duct liner if it is dirty or dusty.  

END OF SECTION 15896
SECTION 15911 - FIRE AND FIRE/SMOKE DAMPERS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To

1. Furnish and install fire or fire/smoke dampers at penetrations of fire rated walls, floors, & ceilings, at ducts, registers, grilles, or louvers as described in Contract Documents.

B. Related Sections

1. General Conditions, Division 01, and Section 15010 apply to this Section.

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies

1. Dampers shall conform to UL and NFPA requirements and bear UL label.
2. Dampers shall be approved by State Fire Authorities where so required.
3. Fire damper installation shall conform to details shown in SMACNA Fire Damper Guide and as required by local codes.

1.3 MAINTENANCE

A. Extra Materials

1. Leave six fusible links of each rating type used on Project with Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Fire Dampers

1. At Walls & Floors - Type "B" with 212 deg F link unless otherwise indicated on Drawings.
2. Ceilings -
   a. Radiation type ceiling fire damper with 212 deg F link unless otherwise indicated on Drawings.
   b. Approved Manufacturers -
      1) Air Balance Inc
      2) Cesco
      3) Pottorff
      4) Safe Air Inc
      5) Ultra Safe
B. Combination Smoke & Fire Dampers -

1. At the wall and ceiling.
   a. Folding blade type.
   b. Motorized damper to operate at 115V and draw 0.2 amps maximum.
   c. Damper shall close on -
      1) Signal from smoke detectors
      2) Power failure
      3) Failure of fusible link.
   d. Minimum of 10 ga galvanized steel sleeve with 18 ga closure and damper blades.
      Blades shall fold into compact package completely out of air stream.
   e. Furnish 212/F UL listed fusible link.
   f. Damper serviceable from access door located on either side of damper.
   g. Approved Manufacturers -
      1) Ruskin
      2) Equal by Prefco or Pottorff

2.2 ACCESS DOORS IN CEILINGS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

B. This Section includes access doors for installation in the following types of construction:

   1. Gypsum drywall.

C. Provide fire-rated access doors.

D. Submittals:

   1. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
      a. Product data in form of manufacturer's technical data and installation instructions for each type of access door assembly, including setting drawings, templates, instructions, and directions for installation of anchorage, devices.
      1) Include complete schedule, including types, general locations, sizes, wall and ceiling construction details, finishes, latching or locking provisions, and other data pertinent to installation.

E. Single-Source Responsibility: Obtain access doors for entire project from one source from a single manufacturer.

F. Fire-Resistance Ratings: Wherever a fire-resistance classification is indicated, provide access door assembly with panel door, frame, hinge, and latch from manufacturer listed in Underwriters Laboratories, Inc.'s "Building Materials Directory" for rating shown.

   1. Provide UL label on each fire-rated access door.
G. Size Variations: Obtain Engineer's acceptance of manufacturer's standard size units, which may vary slightly from sized indicated. Figure 24 x 24 during bid, if not size is given.

H. Coordination: Furnish inserts and anchoring devices that must be built into other work for installation of access doors. Coordinate delivery with other work to avoid delay.

I. Verification: Examine the plans for all fire and fire/smoke dampers and concealed equipment. Provide the sizes for required access doors and concealed equipment. The contractor is responsible for providing fire rated or non rated as need requires.

J. Manufacturers: Subject to compliance with requirements, provide access doors by one of the following:

1. J.L. Industries
3. Milcor, Inc.
4. Nystrom, Inc.
5. The Williams Brothers Corp.

K. General: Furnish each access door assembly manufactured as an integral unit, complete with all parts, and ready for installation.

L. Steel Access Doors and Frames: Fabricate units of continuous welded steel construction unless otherwise indicated. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of support shown.

M. Frames: Fabricate from 16-gage steel.

1. Fabricate frame with exposed flange nominal 1-inch wide around perimeter of frame for units installed in the following construction:
   a. Drywall finish.

2. For gypsum drywall, furnish perforated frames with drywall bead.

N. Flush Panel Doors: Fabricate from not less than 14-gage sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees. Finish with manufacturer's factory-applied prime paint.

1. For fire-rated units, provide manufacturer's standard insulated flush panel/doors, with continuous piano hinge and self-closing mechanism.

O. Locking Devices: Furnish flush, screwdriver-operated cam locks of number required to hold door in flush, smooth plane when closed.

1. Provide one cylinder lock per access door. Furnish 2 keys per lock. Key all locks alike, unless otherwise scheduled.

P. Comply with manufacturer's instructions for installation of access doors.
Q. Coordinate installation with work of other trades.

R. Adjust hardware and panels after installation for proper operation.

S. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

PART 3 - EXECUTION (NOT USED)

END OF SECTION 15911
SECTION 15940 - AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -
   1. Furnish and install wall supply registers, return air grilles, ceiling diffusers, louvers connected to ductwork, and registers as described in Contract Documents.
   2. Quality of grilles installed in metal doors.

B. Products Furnished But Not Installed Under This Section -
   1. Door grilles for wood doors.

C. Related Sections -
   1. General Conditions, Division 01, and Section 15010 apply to this Section.
   2. Division 06 - Installation of door grilles for wood doors.
   3. Division 08 - Furnishing and installing of grilles in metal doors.

1.2 MAINTENANCE

A. Extra Materials -
   1. Leave tool for removing core of each different type of grille for building custodian.

PART 2 - PRODUCTS

2.1 SUPPLY GRILLES & REGISTERS

A. Approved Manufacturers -
   1. Air Control Products
   2. Krueger
   3. Metalaire
   4. Titus
   5. Tuttle & Bailey

2.2 CEILING RETURN

A. Approved Manufacturers -
   1. Air Control Products
   2. Anemostat
   3. Krueger
   4. Metalaire
   5. Titus
2.3 HIGH SIDE WALL RETURN GRILLES

A. Approved Manufacturers -
   1. Air Control Products
   2. Metalaire
   3. Krueger
   4. Titus
   5. Tuttle & Bailey

2.4 CEILING DIFFUSERS

A. Approved Manufacturers -
   1. Air Control Products
   2. Krueger
   3. Titus
   4. Tuttle & Bailey

2.5 LOUVERS

A. Extruded aluminum, with blades welded or screwed into frames and ½ inch mesh 16 gauge aluminum bird screen.

B. Frames shall have mitered corners.

C. Louvers shall be recessed, flanged, stationary, or removable as noted on Drawings.

D. Approved Manufacturers -
   1. Air Control Products
   2. Airolite
   3. American Warming
   4. Ruskin
   5. Vent Products

PART 3 - EXECUTION

3.1 INSTALLATION

A. Anchor securely into openings.

END OF SECTION 15940
SECTION 15970 - CONTROL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Includes But Not Limited To -

1. Furnish and install automatic temperature control system as described in Contract Documents.
2. Furnish and install conductors and make connections to control devices and equipment. Furnish and install exposed raceway (conduit) in Mechanical Rooms.
3. Calibrate, adjust, and set controls for proper operation, operate systems and be prepared to prove operation of any part of control system. This work is to be completed before pre-final inspection.

B. Related Sections -

1. General Conditions, Division 01, and Section 15010 apply to this Section.
2. Section 15891 - Furnishing and installing of temperature control dampers.
3. Division 16 - Furnishing and installing of raceway (conduit) and junction boxes, including pull wires, for temperature control system except as noted above.
4. Division 16 - Power wiring to magnetic starters, disconnect switches, and motors.
5. Division 16 - Motor starters and disconnect switches, unless integral with packaged equipment.

1.2 SYSTEM DESCRIPTION

A. Design Criteria -

1. Install line and low voltage electrical wiring, raceway (conduit), and boxes in accordance with Division 16 of these Specifications.
2. System controls shall be single manufacturer's products.

1.3 SUBMITTALS

A. Shop Drawings -

1. Provide three copies of shop drawing submittal data for review. See Section 15010 for definitions and procedures.

B. Operation & Maintenance Data -

1. Upon completion of work of this Section and prior to final inspection, provide two copies of "as-built" ATC diagrams, schematics, catalog cuts, maintenance instructions, and written operating sequence for each furnace/fan system to be included in Operation & Maintenance Manual specified in Section 15010.
PART 2 - PRODUCTS

2.1 THERMOSTATS AND DAMPERS

A. Programmable low voltage type provided with automatic change over feature for both heating/cooling and ventilating stages, seven day program with one start and stop per day with three hour override, provisions for damper operators and remote sensor.

B. Thermostats to be horizontally mounted.

C. Approved Thermostat Models

1. Honeywell T7350
2. All others by prior approval.

D. Approved Economizer Equipment Models

1. Honeywell W869D, M7415 and C7400.

2.2 CONDUCTORS

A. Color coded and #16 AWG Type TFN or THHN.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Run all wiring in conduit.

B. Safety Controls -

1. Fresh air dampers shall close on fan shut-down, power failure, open fan motor disconnect switch, and when thermostat is in UNOCCUPIED mode.

C. Mount Room Thermostats 4'6" from floor to bottom of thermostat.

D. Mount damper actuators and actuator linkages external of air flow.

E. Provide fresh battery in each thermostat (Mallory MN1604 9 volt alkaline type or equal) and instruct custodian in battery replacement.

3.2 FIELD QUALITY CONTROL

A. Field Service-

1. Calibrate, adjust and set controls for proper operation, operate systems and be prepared to prove operation of any part of control system. This work is to be completed before prefinal inspection.
3.3 ADJUSTING, CLEANING

A. Remove unused wire and conduit from site and test system's controls for two days.

END OF SECTION 15970
SECTION 15985 SEQUENCE OF OPERATION

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

A. Performance Requirements.

1. Thermostat shall control occupied status of fan system based on thermostat heating, ventilating and cooling set points. Fan shall run continuously in occupied modes and cycle in fan "auto" mode.

2. Auxiliary fan cycle switch is provided by thermostat sub-base and is to be used to cycle fan in Occupied mode on both heating and ventilating (Economizer).

3. Adjustable heating, ventilating and cooling set points shall control space temperature by activating either heating, cooling or damper equipment. Sensor and controls provide automatic change over between heating and ventilation.

4. Economizer shall open the fresh air damper to minimum position in occupied mode. On temperature rise, the economizer shall modulate the fresh damper open to maintain a mix air temperature of 45 to 60°F. Above 65°F, the economizer shall return to minimum fresh air position.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION 15985
DIVISION 16 ELECTRICAL

16000 GENERAL

PART 1 GENERAL

1.1 General Conditions and Architectural Special Provisions apply to this division.

1.2 Description:

A. Includes But Not Limited To -
   1. Provide labor, materials, and equipment necessary for completion of this Division as described in Contract Documents.

1.3 Quality Assurance:

A. Requirements of Regulatory Agencies -
   1. NEC and local ordinances and regulations shall govern.

B. Source Quality Control -
   1. Material and equipment provided shall be new, meet standards of NEMA or UL, and bear their label wherever standards have been established and label service is available.

1.4 Prior Approval:

A. General:
   1. Catalog and manufacturer's numbers are for the purpose of establishing standards of quality and types of materials to be used. Products of other manufacturers may be used if equal in quality and design in the opinion of the Engineer and are specifically approved by the Engineer. All submittals for "or equal" approval shall be made no less than ten days prior to bidding.

   2. Any conflict arising from the use of substituted equipment shall be the responsibility of the supplier of that equipment. The contractor and his supplier shall bear all costs required to make equipment comply with the intent of the plans and specifications.

1.5 Submittals:

A. Record Drawings:

B. Shop Drawings:
   1. Prepare submittal for each item of equipment and attach written approval to each indicating that Architectural Special Provisions has been complied with and that shop drawings are correct.

   2. Do not purchase equipment before completion of shop drawing review.

   3. Engineer will not review shop drawings before the contractor has reviewed the shop drawings. The contractor shall stamp all drawings with a statement that he has reviewed all shop drawings and that they conform to the intent of the drawings and specifications.
C. Submittals shall contain:
   1. The first section of the manual shall contain:
      a. Names, addresses, and telephone numbers of Electrical Engineer, General
         Contractor, and any other contractors involved.
   2. Date of submission and dates of any previous submissions.
   3. Project title and number.
   5. The names of Contractor, Supplier, and Manufacturer.
   6. Identification of the product, with the Specification Section number.
   7. Field dimensions, clearly identified as such.
   8. Relation to adjacent or critical features of the Work or materials.
   9. Applicable standards, such as ASTM or Federal Specification numbers.
  11. Identification of revisions on resubmittals.
  12. An 8"x3" space for Engineer's and Contractor’s stamps.
  13. Contractor stamp, initialed or signed, certifying to review of submittal, verification
      of products, field measurements and field construction criteria, and coordination of
      the information within the submittal with requirements of the Work and of the
      Contract Documents.
  14. Submittals shall be furnished on the following equipment:
      a. Service Switchgear
      b. Emergency Lighting Battery Systems
      c. Motor Starters
      d. Disconnect Switches
      e. Overcurrent Protective Devices
      f. Panelboards
      g. Light Fixtures
      h. Switches
      i. Receptacles
      j. Toxalert Control Panel

D. O & M Manuals:
  1. Provide 3 copies of O & M manual with data for all equipment furnished.
     Submittals shall be furnished on the following equipment:
     a. Service Switchgear
     b. Emergency Lighting Battery Systems
     c. Motor Starters
     d. Disconnect Switches
     e. Overcurrent Protective Devices
     f. Panelboards
     g. Light Fixtures
     h. Switches
     i. Receptacles
     j. Toxalert Control Panel
  2. Provide one copy of contractor’s written warranty in each manual.

1.6 Workmanship:

   A. All workmanship shall meet "NECA Standards of Installation".
1.7 Fees And Permits:

A. All permits, fees and charges for inspections required by public authorities shall be paid for by the contractor.

PART 2 PRODUCTS

2.1 Material:

A. Where Manufacturer's names appear, other Manufacturers may be substituted upon obtaining written approval of Architect or Engineer at least 10 days prior to opening of bids.

PART 3 EXECUTION

3.1 Preparation:

A. Confirm dimensions, ratings, and specification of equipment to be installed and coordinate these with site dimensions and with other Section.

3.2 Equipment Identification:

A. Properly identify panelboards, convertible circuit breakers in panelboards, motor disconnect switches, starters, other apparatus used for operation of, or control of, circuits, appliances or equipment by means of engraved laminated plastic descriptive nameplates mounted on apparatus using round head brass machine screws, pop rivets and contact cement. Cardholders in any form are not acceptable.

B. All panelboards, switchboards, transformers, and motor control centers in mechanical areas shall have black and yellow warning tape installed on the floor three feet in front of equipment and along sides to identify 3 feet clearances in front of equipment.

C. All pull boxes and splice boxes shall identify circuits that are inside pull and splice boxes. Label outside of box cover with black ink markers.

D. Label inside of all switch plates and cover plates with panel and circuit numbers.

3.3 Equipment Final Cleaning:

A. At completion of project contractor shall clean all panels which includes vacuuming inside of panel and wiping down all panels.

B. Clean all light fixtures and lamps and remove all dirt, dust, fingerprints, packing etc.

3.4 Field Quality Control:

A. Test systems in presence of Engineer and demonstrate equipment as working and operating properly. Rectify defects at no cost to Owner.
SECTION 16050  BASIC MATERIALS & METHODS

PART 1  GENERAL

1.1 Division 16000 General applies to this Section.

16060  MOUNTING HEIGHTS

PART 1  GENERAL

1.1 Related Documents:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Architectural Special Provisions sections, apply to work of this section.

PART 2  PRODUCTS

2.1 Not used

PART 3  EXECUTION

3.1 Installation:

A. Match existing mounting heights in rooms with existing equipment. Unless otherwise indicated, mount center of outlets or boxes at following heights above finish floor:

- **Receptacles**: 18"
- **Telephones (desk type)**: 18"
- **Telephones (wall type)**: 4’ 0"
- **Computer Outlet**: 18"
- **Switches**: 4’ 0"
- **Wall-Mounted Exit Lights**: 7’ 6” or as shown
- **Wall-Mounted Emergency Lights**: 7’ 6” or as shown
- **Thermostats**: 4’ 0” to top
- **Remote Sensor Outlet**: 4’ 0” to top
- **Distribution Panels**: 24” above floor min
- **Condensing Unit Disconnects**: 5’ 0” or even with top of unit
- **Motor Disconnects**: 5’ 0” to top
- **Telephone Board**: 8’ 6” to top
- **Push Buttons**: 4’ 0"

B. Refer special conditions to Architect and locate outlet under his direction.

C. Meet ADA requirements where applicable.
16110 RACEWAYS

PART 1 GENERAL

1.1 Description:

A. Includes But Not Limited To -
   1. Quality of material and installation procedures for all conduit and fittings used on Project, except as excluded below.

B. Related Work Specified Elsewhere -
   1. See Sections relating to power, lighting, and telephone systems for additional requirements.

PART 2 PRODUCTS

2.1 Material:

A. Conduit -
   1. 3/4 inch unless indicated otherwise and use restricted as indicated by product.
   2. Galvanized rigid steel (Type RMC) -
      a. May be used in all areas.
   3. Galvanized Intermediate Metallic Conduit (Type IMC) -
      a. May be used in indoor locations not in contact with earth.
   4. Galvanized Electrical Metallic Tubing (Type EMT) -
      a. May be used in indoor dry locations where it is -
         1) Not subject to damage.
         2) Not in contact with earth.
         3) Not in concrete slabs on grade.
   5. Schedule 40 Polyvinyl Chloride (PVC) (Type RNC) 3/4 inch minimum -
      a. May be used -
         1) Underground.
         2) In or below concrete.
   6. Flexible Metal Conduit (Type FMC) - 1/2 inch minimum
      a. Use in indoor final connections to -
         1) Mechanical equipment, not to exceed 36 inches.
         2) Recessed fluorescent lighting fixtures, not to exceed 72 inches with ground wire.
         3) FMC shall not be used in wet locations.
   7. Liquid-tight flexible steel conduit (Type LFMC) -
      a. Use in outdoor final connections to mechanical equipment, not to exceed 36 inches.
   8. Type MC cable may be used for branch circuit wiring where concealed.

B. Fittings -
   1. Compression or set-screw steel housing type for EMT, flexible steel, and liquid-tight flexible steel conduits.
   2. PVC -
      a. PVC fittings shall be PVC type. Use PVC adapters at all boxes.
      b. Brush apply PVC cement.
c. All PVC components, (conduit, fittings, cement) shall be from same Manufacturer.

3. Wiremold Surface Metal Raceway -
   a. Surface Metal Raceway (wiremold) shall be installed where shown on the drawings.
   b. All fittings and devices shall be as supplied by Wiremold - specifically designed for the use intended.
   c. No "homemade" fittings shall be allowed.

C. Use of the following is prohibited -
   1. Aluminum conduit.
   2. Electrical non-metallic tubing.
   3. EMT crimp-on, tap-on, indenter type fittings.
   4. Malleable iron or cast set-screw fittings.
   5. Spray (aerosol) PVC cement.
   6. PVC 90 degree bends.

PART 3 EXECUTION

3.1 Installation:

   A. Conceal raceways within ceilings, walls and floors except where exposed raceways are specifically permitted.
   
   B. Keep raceway runs a minimum distance of six inches from hot water pipes.
   
   C. Support conduit and boxes in an approved manner by -
      1. Expansion shields in concrete or solid masonry.
      2. Toggle bolts on hollow masonry units.
      3. Wood screws on wood.
      4. Metal screws on metal.
   
        D. Secure conduit with approved supports within three feet of every bend, outlet box, junction box, gutter, panel, fitting, etc. Do not space supports further apart than ten feet. MC cable shall be supported and anchored in accordance with the NEC.
   
        E. Cap conduit ends during construction.
   
        F. Clean or replace conduits in which water or foreign matter have accumulated.
   
        G. Install grounding type insulated bushings on each end of conduit 1-1/4 inch and larger.
   
        H. Install grounding conductor in PVC conduit.
   
        I. Bending of PVC shall be by hot box bender and for PVC two inches in diameter and larger, expanding plugs.
   
        J. Install conduits into the bottom of panels with adequate space between all conduits to install locknuts and bushings.
   
        K. The following are prohibited -
1. Use of wooden plugs inserted in concrete or masonry units as base for fastening conduits, tubing, boxes, cabinets, or other equipment.
2. Installation of conduit or tubing which has been crushed or deformed.
3. Torches for bending PVC conduit.

L. All 90 degree bends in power and communication conduit systems shall be rigid steel conduit. No PVC 90 degree bends from floor slab up to first outlet box allowed.

M. Run conduit under concrete slabs, not encased in slab.

16120 WIRE & CABLE

PART 1 GENERAL

1.1 Description:

A. Includes But Not Limited To -
   1. All conductors as required to complete project.
   2. Cables for telephone system are to be installed by electrical.

B. Related Work Specified Elsewhere -
   1. See Sections relating to telephone for additional requirements.

PART 2 PRODUCTS

2.1 Material:

A. Conductors -
   1. Copper except where aluminum is allowed to be used.
   2. Minimum size shall be No. 12 except where specified otherwise.
   3. Conductor size No. 8 and larger shall be stranded.

B. Aluminum conductors may be used for service and feeder conductors. Conductors shall bear the UL marking. Aluminum conductor installation shall meet the following requirements:
   1. Aluminum conductor size shall be determined in accordance with the NEC ampacity tables. Aluminum conductor size shall meet the same intent of the design in terms of ampacity and voltage drop as the copper conductors specified for services and feeders. Conduits shall be sized in accordance with the aluminum wire size selected.
   2. Splices and terminals shall be made in an approved manner with connectors specially designed and approved for use with aluminum conductors.
   3. All conductor ends shall be stripped of insulation being careful to avoid nicking the metal. Approved types of oxide-inhibiting compounds containing abrasive conducting particles shall be applied to the conductor and shall thoroughly penetrate spaces between strands.
   4. At lugs in all panels a terminating adaptor shall be installed. Adaptor shall be a Burndy “Hyplug” or equal.
   5. Where bolted, pressure—type connectors are used, they shall be of a type specially designed and approved for use with aluminum conductors. They shall be
of exact size to fit the conductors and shall be drawn up tight to manufacturer’s recommendations.

6. Where high—compression—type connectors are used, they shall be of a type specially designed and approved for use with aluminum conductors. They shall be of exact size to fit the conductors and shall be drawn up tight to manufacturer’s recommendations.

7. Where connections are made between aluminum and copper (two dissimilar metals), provision shall be made to prevent electrolytic action, and all connectors used for this purpose shall be approved.

8. Conductor size shall be determined in accordance with NEC ampacity tables and shall meet the intent in terms of ampacity and voltage drop.

C. Insulation -
1. Local codes shall apply.
2. Conductor size No. 10 and smaller -
   a. Type THWN/THHN. Branch circuit conductors which run through ballast compartments of lighting fixtures shall be code approved for such use.
3. Conductor Size No. 8 and larger - Type THWN/THHN or XHHW.

D. Steel spring wire connectors or pressure type terminal lugs as specified.
1. Connectors shall only be used as specified by manufacturer.
2. Spring type pressure connectors such as "Scotchlock," shall be used for splicing No. 8 and smaller.
3. Splitbolt and/or lug type connectors such as "Burndy," shall be used for splicing No. 6 and larger.
4. Crimp on spade or ring tongue lug connectors for connection to terminal boards such as Thomas & Betts, “Sta-Kon,” shall be used.

PART 3 EXECUTION

3.1 Performance:

A. Install conductors in raceway unless indicated otherwise.

B. Pulling Conductors -
1. Do not pull conductors into conduit until raceway system is complete and cabinets and outlet boxes are free of foreign matter and moisture.
2. Do not use heavy mechanical means for pulling conductors.
3. Only wire pulling lubricant may be used.

C. Conductors shall be routed in panels in a neat and orderly manner with adequate wiring length to route to all breakers. Wiring shall be routed with 90 degree bends into circuit breakers and shall be tied at points to keep wiring neatly dressed.

D. Conductors shall be continuous from outlet to outlet.

E. Make splices for conductors No. 8 and smaller with steel spring wire connections. Splice larger conductors with pressure type terminal lugs.

F. Route circuits at own discretion, however, circuit numbers shall be according to drawings.
G. All circuits shall have separate neutral installed to meet requirements of NEC 210.4 (B).

H. Run conductors of same circuit in same conduit.

I. Run conductors of different voltage system in separate conduits.

J. Color code conductors as follows -

240/120V
Single Phase

1. Phase A - Black
2. Phase B - Red
3. Phase C - --
4. Neutral - White
5. Ground - Green

16121 WIRE CONNECTIONS & CONNECTING DEVICES GENERAL

PART 1 DESCRIPTION:

1.1 Includes But Not Limited To -

A. Furnish and install wiring devices complete with plates as described in Contract Documents.

PART 2 PRODUCTS

2.1 Material:

A. Switches & Receptacles -
   1. Switches and receptacles listed are 15 ampere and switches are single pole. Where three-way, four-way, two pole, or higher ampere switches are required, they shall be of same series as those listed. Devices of a similar type shall be of same Manufacturer.
   2. Color shall be same as plate.
   3. Approved Manufacturers for Switches -

<table>
<thead>
<tr>
<th></th>
<th>15A</th>
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<td>20AC-1</td>
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4. Approved Manufacturers for Receptacles -

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<th>15A GFI Receptacles</th>
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</tr>
<tr>
<td>Pass &amp; Seymour</td>
<td>5262</td>
<td>5362</td>
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</tbody>
</table>

B. In Use Weatherproof Receptacles -
1. Approved Manufacturer -
   a. Taymac MX3200 Extra Heavy Duty
   b. Intermatic WP3110MXD, WP1030MXD, WP1010MXD, WP1010HMXD
   c. Engineer approved equal.

C. Plates -
   1. Nylon, fiberglass, or high impact resistant plastic nylon.
   2. Regular heavy plastic may be used only for gang plates more than two gang.
   3. Device, telephone, and switch plates shall be smooth style and ivory in color where located on light colored walls and brown on dark walls unless directed otherwise by Architect.
   4. Gang switches shall have gang plates.
   5. Do not use metal plates.
   6. Label inside of all switch plates and cover plates with panel and circuit numbers.

16134 OUTLET BOXES

PART 1 GENERAL

1.1 Description:
   A. Includes But Not Limited To -
      1. Furnish and install outlet boxes at outlet locations described in Contract Documents.

1.2 Job Conditions:
   A. Coordination -
      1. Coordinate location of outlets which are intended to be above or adjacent to millwork.

PART 2 PRODUCTS

2.1 Material:
   A. Outlet Boxes -
      1. Galvanized steel and correct size and shape.
      2. Provide metal supports and other accessories for installation of each box.
      3. Equip ceiling and bracket fixture boxes with fixture studs where required.
      4. Equip outlets with extensions as required to bring box flush with finish surface.
B. Floor Outlets - Where shown on drawings with all associated hardware.
   1. Hubbell B-2536
   2. Engineer approved equal.

PART 3 EXECUTION

3.1 Installation:
   A. Boxes shall be readily accessible and installed with approved cover.
   B. Sectional boxes shall not be used in concrete.
   C. Locate boxes so outlets are not obstructed by pipes, ducts, or other items.
   D. Install outlets flush or not more than 1/4 inch behind finished surface and level and plumb.
   E. Boxes for switches shall generally be located within six inches of door jamb.
   F. Properly center single outlets in each room. Where two or more outlets occur, space them uniformly and in straight lines with each other.
   G. All outlets on J-Boxes not used shall have blank covers installed.

16155 MOTOR STARTERS

PART 1 GENERAL

1.1 Description:
   A. Provide and install motor starters with starters of types, grades, and sizes as shown on the drawings. Install complete assembly including, but not necessarily limited to enclosures, thermal magnetic circuit breaker, motor starter, fuses, heaters, control transformer, control switch, and other components, accessories and mounting hardware as needed for a complete system.

PART 2 PRODUCTS

2.1 Materials:
   A. Motor Starters:
      1. Provide and install motor starters and auxiliary components; of types, sizes, rating and electrical characteristics as shown on the drawings, which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for a complete installation.
B. Approved Manufacturers:
   1. Cutler Hammer
   2. General Electric
   3. Siemens
   4. Square D

PART 3 EXECUTION

3.1 Installation:
   A. Install motor starters as indicated on the drawings and in accordance with
      manufacturer's written instructions and complying with recognized industry practices to
      ensure that products serve intended functions.
   B. Install fuses in fusible holders for control transformer. Install heater elements in
      overload relays. Terminate all wiring in starter enclosure.
   C. Install mounting supports as shown on the drawings as needed.
   D. Identify motor control center cubicles with black laminated plastic nameplates with
      white 1/8 inch engraved letters. Attach with screws.

16170 MOTOR & CIRCUIT DISCONNECTS

PART 1 GENERAL

1.1 Description:
   A. Includes But Not Limited To -
      1. Furnish and install disconnects as described in Contract Documents.

PART 2 PRODUCTS

2.1 Material:
   A. Heavy duty quick-make, quick-break type, nonfused safety switch with visible knife
      blade unless indicated otherwise.
   B. Motor circuit disconnects shall be horsepower rated.
   C. Enclosures shall be NEMA Type 1 or, where indicated as weatherproof, NEMA Type
      3R.
   D. Approved Manufacturers:
      1. Cutler Hammer
      2. General Electric
      3. Siemens
      4. Square D
PART 3 EXECUTION

3.1 Installation:

A. Identify all disconnect switch nameplates with panel, circuit number and device served. Nameplates shall be black laminated plastic with 1/8 inch white engraved letters. Attach with screws.

16180 OVERCURRENT PROTECTIVE DEVICES

PART 1 GENERAL

1.1 Division 16000 General applies to this Section.

1.2 Description:

A. Includes But Not Limited To -
   1. Extent of overcurrent protective device work is indicated by project plans and schedules. Overcurrent protective devices specified herein are for installation as individual components in separate enclosures; and for installation as integral components of switchboards and panelboards. See Section 16470, Panelboards.
   2. Types of overcurrent protective devices in this section include the following for operation at 600 volts and below:
      a. Molded case circuit breakers.

1.3 Quality Assurance:

A. Comply with NEC requirements and NEMA and ANSI standards as applicable to construction and installation of overcurrent protective devices.

PART 2 PRODUCTS

2.1 Acceptable Manufacturers:

A. Subject to compliance with requirements, provide products of one of the following (main and branch device manufacturer must be same as panelboard and/or switchboard manufacturer):
   1. Cutler Hammer
   2. General Electric
   3. Square D
   4. Siemens

2.2 Molded Case Circuit Breakers:

A. Provide factory-assembled, molded case circuit breakers for power distribution panelboards and switchboards; and for individual mounting, as indicated. Provide breakers for amperage voltage, and RMS interrupting rating shown, with permanent thermal trip and adjustable instantaneous magnetic trip in each pole. Construct with overcenter, trip free toggle type operating mechanisms with quick-make, quick-break action and positive handle indication. Construct breakers for mounting and operating.
in any physical position and in ambient temperature of 40 degrees C. Provide with mechanical screw type removable connector lugs, AL/CU rated.

2.3 Maintenance Stock, Fuses:

A. For types and ratings required, furnish additional fuses, amounting to one unit for every 5 installed units, but not less than two units of each size and type.

PART 3 EXECUTION

3.1 Installation of Overcurrent Protective Devices:

A. Install overcurrent protective devices as indicated, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation of overcurrent protective devices.

B. Coordinate with other work as necessary to interface installation of overcurrent protective devices with other work.

C. Set field-adjustable circuit breakers for trip settings as indicated, subsequent to installation of devices.

D. Install fuses in overcurrent protective devices.

E. Field test all ground fault protective devices for proper operation; test to be performed by representative of the manufacturer. Include verification of complete time current trip characteristics.

3.2 Field Quality Control

A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.
SECTION 16400  SERVICE & DISTRIBUTION

PART 1  GENERAL

1.1  Section 16000 applies to this section.

16405  ELECTRIC SERVICE

PART 1  GENERAL

1.1 Description:

A. Includes But Not Limited To -
   1. Furnish and install service as described in Contract Documents and as required by local serving agency.
   2. Cost of completion of service shall be included and paid for by this section.
   3. Furnish and install combination meter/current transformer cabinet.

B. Job Conditions:
   1. Coordinate with serving agency on all items, especially service entrance fittings, meter sockets, and C/T boxes where required.

16450  GROUNDING

PART 1  GENERAL

1.1 Description:

A. Includes But Not Limited To -
   1. Provide grounding for entire electrical installation as shown below and described in Contract Documents.
      a. Electrical service, its equipment and enclosures.
      b. Neutral or identified conductor of interior wiring system.
      c. Main panelboard, power and lighting panelboards.
      d. Conduits and other conductor enclosures.
      e. Non-current-carrying metal parts of fixed equipment such as motors, starter, and controller cabinets, instrument cases, and lighting fixtures.

PART 2  PRODUCTS

2.1 Material:

A. Size materials as shown on Drawings and in accordance with applicable codes.

B. Ground wires No. 6 and smaller shall have green insulation. Ground wires No. 4 and larger shall be bare or shall have green tape at conductor connections.

C. Ground rods shall be 5/8" x 8' copperweld.
D. Make grounding conductor connections to ground rods and water pipes using approved bolted clamps of bronze or brass designed for such use.

PART 3 EXECUTION

3.1 Installation:

A. Grounding connection to main water supply shall be accessible for inspection and made within 6 inches of point of entrance to building or ahead of dielectric, if used, on meter side.

B. Connect No. 4 copper wire to 20 foot of No. 2 rebar in footing (UFER Ground) and bond to service ground.

C. Install additional ground rods as required by applicable codes and as indicated on Drawings.

D. Ground identified grounded (neutral) conductor of electrical system on supply side of main service disconnect.

E. Pull ground conductors in non-metallic raceways and in flexible steel conduit exceeding 6 feet long. Use same size ground as phase conductors up through #10 AWG. Use NEC Table 250-122 for all others unless noted otherwise on Drawings.

16470 PANELBOARDS

PART 1 GENERAL

1.1 Description:

A. Includes But Not Limited To -
   1. Furnish and install panelboards as described in Contract Documents.

PART 2 PRODUCTS

2.1 Material:

A. Main panelboard -
   1. Circuit breakers of type and size shown on Drawings. Multi-pole breakers shall be common trip.
   2. Minimum interrupting capacity of 22,000 amperes or as shown otherwise.
   3. Bussing arranged as required.
   4. Ground bus bonded to cabinet.
   5. Hinged door cover.

B. Sub-Panelboard -
   1. Circuit breakers of type and size shown on Drawings. Multi-pole breakers shall be common trip.
   2. Minimum interrupting capacity of 10,000 amperes or as shown otherwise.
   3. Bussing arranged as required.
5. Ground bus bonded to cabinet.
6. Quality Standard - Square D "NQOD".
7. Hinged door cover.

C. Panelboard Cabinets -
   1. Mono-flat (no screws) for flush or surface mounting as indicated with locking doors with card index holders and three keys.
   2. Key locks alike.

D. Approved Manufacturers -
   1. Cutler Hammer
   2. General Electric
   3. Siemens
   4. Square D

PART 3 EXECUTION

3.1 Installation:

A. Identify panelboards with black laminated plastic name plates with white 1/8 inch engraved letters. Attach with screws.

B. Provide typewritten circuit schedules in panelboard to identify panelboard and each branch breaker.

C. All panelboards shall have hinged door covers.

D. At completion of project contractor shall clean all panels which includes vacuuming inside of panel and wiping down all panels.
SECTION 16500 LIGHTING

PART 1 GENERAL

1.1 Section 16000 applies to this Section.

16510 INTERIOR BUILDING LIGHTING

PART 1 GENERAL

1.1 Description:

A. Includes But Not Limited To -
   1. Furnish and install lighting system as described in Contract Documents complete with lamps.

B. Related Work Specified Elsewhere -
   1. See Section 16050 for general requirements.

1.2 Job Conditions:

A. Coordination -
   1. Coordinate with ceiling layout to obtain symmetrical arrangement of fixtures in acoustical tile ceiling.

PART 2 PRODUCTS

2.1 Material:

A. Lighting Fixtures -
   1. See Fixture Schedule on Drawings.
   2. All alternate light fixture packages shall be submitted a minimum of 10 days prior to bid for approval.

B. Electronic Ballasts -
   1. Electronic type with ballast for F32T8 lamps voltage matching system voltage with THD less than 10%.
   2. Ballasts shall match lamps selected.
   3. All fluorescent fixtures shall have a disconnecting means on fixtures that can be serviced in place per 2008 NEC 410.110G.
   4. Approved manufacturers and models -
      a. Phillips Advance Optanium or Centium
      b. Osram Sylvania - Quicktronic Series
      c. GE - UltraMax or UltraStart series

C. HID Ballasts
   1. High power factor premium ballasts for HID fixtures.

D. Lamps
   1. Fluorescent T-5:
      a. 20,000 hour minimum life.
b. Rapid start 4100K phosphor

c. CRI - greater than 80:

d. Manufacturer:
   1) Osram Sylvania Pentron Premier Eco® T5
   2) GE Starcoat High Efficiency
   3) Engineer approved equal

2. Fluorescent T-8:
   a. 20,000 hour minimum life,
   b. Rapid start 4100K phosphor
   c. CRI - greater than 80
   d. 2,900 lumen minimum
   e. Manufacturer:
      1) Phillips Alto Advantage 41K
      2) G.E. Ecolux high lumen SPX41
      3) Osram Sylvania Octron XPS
      4) Engineer approved equal

3. HID:
   a. Clear diffuse lamps sized as shown on the fixture schedule
   b. Manufacturer:
      1) G.E.
      2) Phillips

PART 3 EXECUTION

3.1 Installation:

   A. Do not locate light fixtures in closet or storage areas within 18 inches of shelves. Do not locate fluorescent fixtures within six inches of shelves.

   B. Securely fasten fixtures in place in all areas. Fixtures located in secure areas shall be anchored at four corners.

   C. Where recessed lighting fixtures are to be installed, provide openings, plaster rings, etc., of exact dimensions for such fixtures to be inserted in openings. Terminate circuits for recessed fixtures in an extension outlet box near fixture and connect with 1/2 inch flexible conduit in accordance with Contract Documents.

   D. Where fluorescent units are shown installed end to end, provide suitable connectors or collars to connect adjoining units to appear as a continuous unit.

   E. Each fixture shall be wired with a 72 inch piece of flexible conduit connected to a blank covered junction box located in the accessible ceiling space within 36 inches of the fixture connection point.

   F. Do not install fixture lens enclosures or louvers in fixtures until general construction work is complete, including painting.

   G. All light fixtures and lamps shall be left clean at the time of substantial completion of the work. It is the responsibility of the electrical contractor for protection and final cleaning of fixtures. If fixtures are dirty at completion of the project, the Contractor shall clean them at no additional cost to the Owner.
3.2 Light Fixture Attachment:

A. Light fixtures in ceiling grid shall be mechanically attached to grid per NEC 410-16 (two per fixture unless independently supported).
   1. Surface-mounted fixtures shall be attached to grid.
   2. Pendant-hung fixtures shall be directly supported from structure with 9-gauge wire (or approved alternative).
   3. Rigid lay-in or can light fixtures:
      a. <10 lbs. - one wire to structure (may be slack).
      b. 11 to 56 lbs. - two wires from housing to structure (may be slack).
      c. >57 lbs. - supported directly to structure by approved method.
PART 1 GENERAL

1.1 Section 16000 applies to this Section.

16740 TELEPHONE SYSTEMS

PART 1 GENERAL

1.1 Description:

A. Includes But Not Limited To -
   1. Furnish and install main service raceway.
   2. Furnish and install building telephone raceway and cable system as described in Contract Documents.

B. Related Work Specified Elsewhere -
   1. Telephone company to furnish and install main service cable.
   2. Telephone company to terminate building cables at terminal board.
   3. Furnishing and installing of telephones by Owner.
   4. See Section 16050 for general requirements.

PART 2 PRODUCTS

2.1 Material:

A. Telephone outlet box shall be single device box.

B. Raceway -
   1. See Section 16110.

C. Building Telephone System Cable -
   1. Category 5e four pair cable.
   2. Equal as approved by Engineer prior to bid.

D. Modular phone jack (RJ11C) assembly for desk outlets.

E. Blank plate for wall outlet where a modular jack is not installed.

F. Intersystem bonding ground bar for communication's bonding point.

G. Bare copper ground wire for telephone service ground.

PART 3 EXECUTION

3.1 Installation:

A. Install main service raceway as directed by telephone company. Leave measured 500 lb. pull string in raceway.
B. Install telephone terminal board as indicated on drawings.

C. Install raceway and cable from terminal board to each telephone outlet unless indicated otherwise on drawings.

D. Install #6 CU ground wire from telephone backboard to electrical service ground.

E. Terminate cables at each desk outlet with specified modular telephone jack assembly.

F. Leave adequate slack cable at terminal board for termination of each cable run.

G. Install intersystem bonding ground bar at point of service per NEC 250.94. Intersystem bonding ground bar shall be ERICO Model #IBTB or equal.

16768 NETWORKING & TELECOMMUNICATIONS STRUCTURED CABLING

PART 1 GENERAL

1.1 Scope:

A. This specification may impact other trades. When there is a conflict in the construction document between trades, this General Structured Cabling Minimum Specification prevails. As an example, the construction document may instruct the electrical contractor to provide telecommunications grounding/bonding and conduit runs in the electrical section of the construction document. If there is a conflict between the electrical specification and the telecommunications specification, the telecommunications specification prevails.

1.2 Standards:


B. Bidders shall be fully acquainted with the above referenced standards and be fully qualified, as outlined in the Telecommunications contractor qualifications, to bid on and perform work. Bidders shall have manufacturer authorization, qualifications and certifications to install and test a Category 5E (CAT 5E) Ortronics/Superior Essex nCompass 1G Channel Solution and 1000BaseTX/FX intra-building backbone. The network cabling infrastructure must be installed by manufacturer approved designers and certified contractors at the Certified Installer Plus-Enterprise Solutions Partner (CIP-ESP) tier or Certified Installer Plus (CIP) tier in accordance with manufacturer’s installation instructions and specifications.

C. All station and riser cabling shall be tested and certified by successful bidder to support 1000BaseTX/FX technology. Additionally, the successful electrical and telecommunications contractor(s) shall follow appropriate installation guidelines, as contained in the most currently available BICSI TDMM, ANSI/TIA/EIA, NEMA WC 26, and NFPA 70 manuals.
1.3 Telecommunications Contractor Qualifications:

A. Only qualified and experienced Telecommunications contractors perform design, project management, and installation services in the construction of the structured cabling infrastructure. All successful contractors must have the manufacturer authorizations, qualifications, capabilities, test equipment, expertise, and personnel necessary to provide an efficient and successful installation of properly operating components, as specified.

B. A contractor, by responding to a bid, represents that their company possesses the manufacturer authorizations, qualifications, certifications, capabilities, test equipment, expertise, and personnel necessary to provide an efficient and successful installation of properly operating components, as specified.

C. Bidder must meet the requirement of having continuously performed Telecommunications installation work for a period of at least five (5) years. The Telecommunications contractor must be an approved Ortronics Certified Installer at a Plus tier (CIP, CIP-ESP). A copy of certification documents must be submitted with the bid in order for such bid to be valid. The Telecommunications contractor is responsible for workmanship and installation practices in accordance with the Ortronics CIP Program. Ortronics/Superior Essex will extend an nCompass Limited Lifetime Warranty.

D. Prior to submitting bid, bidder is required to carefully consider the amount and character of the work to be done, as well as the difficulties involved in its proper execution. Bidder should include in their bid all costs deemed necessary to cover contingencies essential to successfully installing the specified system. Any cost not specifically itemized in the proposal shall not be incurred unless specifically agreed upon by all parties and documented in writing. No claims for compensation will be considered or allowed for extra work resulting from lack of knowledge of any existing conditions on the part of the bidder.

E. As a requirement to bidding and performing awarded work, Telecommunications contractor shall have currently trained, registered, and certified BICSI Technicians and at least (1) Registered Communication Distribution Designer (RCDD) on staff as full-time employees. A copy of the RCDD certifications and BICSI member number must be provided with bidding documents.

F. Telecommunication contractor must be skilled and proficient in both inside cable plant (copper and fiber optics) installation, as well as outside cable plant (copper and fiber optics) installation, termination, splicing, and testing. Telecommunications contractor must be certified by the manufacture of the structured cable system specified in this document. (See 1.5 Materials)

1.4 Documentation:

A. Prior to system acceptance, the successful bidder shall submit to the owner fully documented 8.5-in. x 11-in. scale drawings of the entire fiber optic and copper distribution system. Documentation shall be provided in both a hard copy binder and a soft copy on CD capable of being viewed and edited in MS Visio. This will include building and floor layouts with appropriate labeling and locations of workstation Telecommunications Outlet (TO), Equipment Room/Telecommunications Room.
(ER/TR), Main Cross Connect/Intermediate Cross Connect (MC/IC), cable routes, interconnect locations, riser locations, and all other information pertinent to the installation.

B. Successful bidder will be responsible for accurately labeling and identifying all relevant components of the cabling system, including, but not limited to: Telecommunications Outlet (TO) face plate labeling; patch panel and block labeling and color-coding; backbone cable labeling at entrance to MC, BEF/IC/ER, and HC/TR; fiber optic patch panel labeling and color-coding, cables at each end, conduits at each end, and grounding system. Reference


1.5 Materials:

A. The Telecommunications contractor must be an approved Ortronics Certified Installer at a Plus tier (CIP, CIP-ESP). A copy of certification documents must be submitted with the bid in order for such bid to be valid. The Telecommunications contractor is responsible for workmanship and installation practices in accordance with the Ortronics CIP Program. Ortronics/Superior Essex will extend an nCompass

B. Bidder should expect to present quotes based on the following itemized manufacturer's products. The horizontal workstation structured cabling system shall be an Ortronics/Superior Essex nCompass Cat 5e U/UTP Channel Solution. Bidder shall be authorized and certified, by the manufacturer's representative, to install, certify and warranty the structured cabling system. The specified Ortronics/Superior Essex nCompass channel solution is not substitutable. Ortronics/Superior Essex will extend an nCompass Limited Lifetime Warranty

Ortronics CIP Program.

1. Horizontal Work Station Cable-
   a. Superior Essex Cobra CAT 5e+, POP Box, CMP, Category 5E, 4 twisted pair, 24 AWG, FEP, Station Wire for Plenum air return systems.

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<th>Flame Rating</th>
<th>Jacket</th>
<th>Color</th>
<th>Part No.</th>
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<td>1)</td>
<td>CMP Plenum</td>
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<td>Cobra CAT 5e+52-241-28</td>
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<tr>
<td></td>
<td>PVC Alloy</td>
<td>Yellow</td>
<td>Cobra CAT 5e+52-241-68</td>
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<tr>
<td></td>
<td></td>
<td>Light Gray</td>
<td>Cobra CAT 5e+52-241-38</td>
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2. Intra-Building Backbone Cable-
   b. Corning fiber optic riser cable, 6/6 Hybrid (6) strand, multi-mode, 62.5/125um, 3.5/1.0 dB, and (6) strand single-mode, MIC, TBII tight buffer tube construction, FEP.

3. Workstation Telecommunications Outlet (TO)-

<table>
<thead>
<tr>
<th>Description</th>
<th>Part No.</th>
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<tbody>
<tr>
<td>a. Ortronics TracJack USOC 6P6W RJ25C</td>
<td>OR-63700005-13</td>
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<tr>
<td>b. Ortronics TracJack T568A/B 180 deg</td>
<td>OR-TJ5E00-44 Dark Yellow Jack</td>
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</table>
c. Ortronics TracJack T568A/B 180 deg Dark Blue Jack OR-TJ5E00-36
   d. Ortronics TracJack Face Plate 3-Port Wall Plate OR-40300547-13
   e. Ortronics TracJack Blank Modules (Pk of Ten) Ivory Blank OR-42100002-13

4. IC/HC ER/TR Patch Panel Data Termination-

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<tr>
<th>Description</th>
<th>Ports</th>
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<tr>
<td>a. Ortronics High Density Patch Panel Modular to 110 T568A/B</td>
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5. Patch Cords-

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<td>OR-MC5E05-06</td>
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<td>a. Blue, 4-pair</td>
<td>7-ft.</td>
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<td>a. Blue, 4-pair</td>
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6. IC/HC ER/TR 110 Block Voice Termination-

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<thead>
<tr>
<th>Description</th>
<th>Part No.</th>
</tr>
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<tbody>
<tr>
<td>a. Ortronics 200-pair 19-in. Rack Mount 110 Field Termination Block/Panel Kit includes two 100-pair 110 blocks without legs, with (40) 110C4 and (8) 110C5 connecting blocks, two jumper troughs, and designation.</td>
<td>OR-302003251</td>
</tr>
<tr>
<td>b. 100-pair wall mount 110 Field Termination Block with (20) 110C4 and (4) 110C5 connecting blocks and snap-on label designation field.</td>
<td>OR-110ABC5E100</td>
</tr>
<tr>
<td>c. 110C5 Connecting Blocks, five-pair, Pk of ten.</td>
<td>OR-30200110</td>
</tr>
</tbody>
</table>

7. Outside Cable Plant and Termination-
   a. Copper and fiber optics pair/strand count, composition and termination to be

8. Equipment Racks and Cabinets-
   a. For Standard Equipment and Telecommunications Room Installations:
      1) Hubbell Next Frame 19-in. x 7-ft. Equipment rack with 6-in. Vertical Organizer - 6-in. wide Z Channel and cover and Horizontal Cable Management. Black finish.

9. Other-
   b. ERICO, Inc., CADDY CableCat Fasteners ("J" Hooks).
   c. Carlon CF4X1C-5200 corrugated FEP orange inner duct.

PART 2 CABLE PLANT
2.1 Equipment And Telecommunications Room Requirements:

A. Each BEF/IC/ER and HC/TR shall be a stand-alone wiring closet located centrally such that no single UTP horizontal cable run shall exceed 90 meters, when terminated at each end, nor shall horizontal cable runs span floors. There shall be a minimum of one ER/TR per floor in a multi-level building. BEF/IC/ER and HC/TR shall not be co-located in custodial, mechanical or other shared space where damage to critical electronics may occur. Each room shall be sized according to use, and meet the below listed criteria.

B. Each BEF/IC/ER shall have a minimum of (2) 4-in. inside diameter EMT conduits run to each HR/TR. Each conduit shall have (3) 1-in. corrugated inner-duct installed.
1. No right angle bends or LBs allowed. 60 degree sweep maximum allowed.

C. General Requirements
1. **Floor Size**: BEF/IC/ER 10-ft. x 12-ft. Minimum
2. **Floor Size**: HC/TR 8-ft. x10-ft. Minimum
3. **Floor Surface**: Treated concrete or tile.
4. **Floor loading**: 50 lb/ft² minimum or as required by applicable codes.
5. **Ceiling Height**: 8.5 -ft above finished floor
6. **Door Size**: 3-ft. wide and 6.7-ft. tall w/180 degree swing away from backboards and racks.
7. **Wall Lining (backboard)**: AC-grade 3/4-in. x 4-ft. x 8-ft. sheets plywood, with no voids, covered on all sides with two coats flat black fire retardant paint.
8. **Lighting**: Minimum 500 lux measured at 3-ft. above finished floor
9. **Power**: Provide (6) dedicated, isolated, non-switched, 4-way, 120Vac 20Amp circuits.
10. **Grounding and Bonding**: Install a contiguous Intra-building grounding and bonding system in compliance with TIA/EIA-607 using a minimum conductor size of 6 AWG to be located on each plywood backboard with Grounding Bus Bar as directed.
11. **Security**: Unique telecom key separate from building master, custodial, or mechanical.
12. **Location**: Room shall be located such that no single horizontal workstation cable shall exceed 90 meters from the TO to the TR/ER termination.
13. **HVAC**: Maintain constant temperature of 64° - 75° F with minimum of one air change per hour. Networking/Telecommunications equipment heat dissipation is estimated at 3000 Watts per hour. 3.7 x 3000 = 11,100 BTU per hour.
14. **Fire Protection**: As required by applicable codes.
15. **Equipment Rack**: 7-ft. x 19-in. equipment rack with wire management (as specified in materials list) and ladder rack shall be provided and installed as directed.

D. No Intra or Inter-building telecommunications cable shall be run adjacent and parallel to power cabling. A minimum of 5-in. distance is required from any fluorescent lighting fixture or power line up to 2kVA and 24-in. from any power line over 5kVA. Similarly, cable should be routed and terminated as far as possible from sources of EMF, such as ballasts, generators, fans, motor control units, motors, etc.

E. The BEF/IC/ER and HC/TR structured cable system shall be constructed using materials as specified in the materials list. Horizontal station cable, AND riser cables,
shall be terminated in the appropriate location on the racking system. Voice cables shall be terminated on the appropriate 110 system. Data cables shall be terminated in the appropriate patch panels. Fiber optics shall be terminated in the appropriate fiber optic termination assembly. Cable termination, order of termination, color-coding, grouping, numbering plan, and labeling shall be performed in accordance with BICSI TDMM Telecommunications

2.2 Entrance Facilities:

A. Outside plant requirements are determined per project. At a minimum, contractor shall ensure entrance facilities will support a multi-exchange carrier WAN environment with provisions for (1) DS3 circuit and (25) pair copper facilities with future expansion to OC48 and (100) pair copper facilities.

B. Grounding and Bonding shall conform to NEC Article 250 and TIA/EIA-607 using a minimum conductor size of 6 AWG.

2.3 Horizontal Workstation Cable:

A. Each Workstation Telecommunications Outlet (TO) shall have (3) Category 5E cables. The gray cable and ivory jack shall be designated as analog voice and the blue and yellow cables and jacks shall be designated for data communications.

B. Each Computer Lab TO shall have (2) Category 5E cables. The blue and yellow cables and jacks shall be designated for data communications. Each Telecommunications Outlet (TO) shall have (3) jacks in each outlet plate as follows:
1. Install (1) Gray Category 5E (CAT 5E) 4-Pair UTP cable terminated at the TO in an Ivory RJ25C USOC jack and at the HC/TR in the rack mounted (or backboard mounted) 110 system as appropriate.
2. Install (1) Blue CAT 5E 4-Pair UTP cable terminated at the TO in a Blue RJ45 CAT 5E jack and at the HC/TR in the rack mounted patch panel system.
3. Install (1) Yellow CAT 5E 4-Pair UTP 1.cable terminated at the TO in a Yellow RJ45 CAT 5E jack and at the HC/TR in the rack mounted patch panel system.
4. Cables shall be distributed in a horizontal star topology from each TO to the HC/TR. Total terminated length of cable from TO to HC/TR shall not exceed 90 meters total length. Each horizontal cable shall be installed in a "home-run" configuration. No "daisy chained" conduit or cables shall be allowed. No horizontal cable run shall span between floors. A minimum 12-in. service loop shall be provided at each TO and 24-in. at each HC/TR.
5. All cables shall be installed using conduit, cable tray, or "J" hooks. Where cables are not installed in conduit or cable tray, the cable shall not be pulled or installed directly across suspended ceiling tiles or fluorescent lights without proper suspension and consideration of possible electrical interference. If "J" hooks are used, avoid placing any pressure or creating stress points on the cable. Maximum spacing between "J" hooks shall not exceed five feet. Suspended ceiling support wires shall not be used to support cables or cable support system(s).
6. At no time shall pulling tension exceed 25 lbs. on horizontal cables. Exceeding the maximum recommended pulling tension during installation of cables will compromise wire integrity. If wire integrity is compromised, the wire may not pass testing and certification standards required for a 1000BaseTX infrastructure. The installing contractor will be responsible for replacement of any cable system that does not pass required certification standards.
7. Traditional nylon synth style Tie Wraps shall not be used to bundle cables. Only Velcro Tie Wraps are acceptable to bundle cables. Cables shall be dressed in loose, neat bundles.

8. No Intra-building telecommunications cable shall be run adjacent and parallel to power cabling. A minimum of 5-in. distance is required from any fluorescent lighting fixture or power line up to 2kVA and 24-in. from any power line over 5kVA. Similarly, cable should be routed and terminated as far as possible from sources of EMF, such as ballasts, generators, fans, motor control units, motors, etc.

9. Horizontal UTP station cable shall be terminated at the HC/TR in a manner such that each workstation location will be numbered and terminated in sequential order. Voice (Gray) cable shall be terminated at the 19-in. x 7-ft. stand-alone rack in rack mounted (or backboard mounted) 110 blocks as specified in materials list. Each 100 pair 110 block will support (24) 4-pair cables. Designator strips shall be blue in color. Data (Blue & Yellow) cables shall be terminated in Ortronics High Density T568A/B wired Patch Panels as specified in materials list and shall be located in 19-in. x 7-ft. stand-alone rack as specified in materials list. Horizontal and vertical fiber optic cable shall be terminated at BEF/IC/ER and HC/TR in Corning fiber optic distribution centers as specified in materials list.

10. Each TO location shall use Ortronics TracJack hardware as specified in materials list. The gray CAT 5E cable shall be terminated USOC in an Ivory RJ25C jack. The Blue and Yellow CAT 5E cable(s) shall be terminated TIA/EIA T568A in (1) Blue and (1) Yellow CAT 5E RJ45 jacks. Stripping of cable jacket, untwisting of conductor pairs and termination shall be done using TIA/EIA conventions. 12-in. of excess, jacketed, cable shall be coiled in the outlet box to accommodate future re-termination. Maintain UTP cable pair twists up to the point of termination (maximum of up to 1/4-in. jacket removal allowed) at both the station/outlet end as well as patch panel/ block end for each horizontal cable. Take caution as to refrain from physically changing or damaging the shape or geometry of the cable during installation, i.e., do not cinch cable ties too tightly; avoid kinks and sharp bends in cable. Do not place bundles in such a way that the weight of large bundles is damaging the cables on the bottom of the bundle. Each TO wall plate shall be numbered sequentially, consistent with the HC/TR number layout using an acceptable labeling system.

11. Successful bidder shall test and certify, in writing, building wiring meets or exceeds all applicable TIA/EIA 568, 569, 606, 607, etc. conventions and standards. Successful bidder shall test and certify, in writing, building wiring shall support 1000Base TX/FX (gigabit) Ethernet technologies. Ortronics/ Superior Essex will extend an nCompass Limited Lifetime Warranty

2.4 Vertical Riser Cable:

A. Install a minimum of (2) 4-in. conduit paths between the BEF/IC/ER and each HC/TR.

B. For each (12) telephone workstation locations there shall be a (25) pair copper riser from the HC/TR to the BEF/IC/ER. Copper riser cable shall be of a 25 Pair Category 5E FEP rated construction as specified in materials list. All riser cable shall be terminated using 110 wiring distribution systems as specified in materials list. Riser cable shall be terminated on a separate 100 pair block from horizontal station cable. Designator strips shall be gray in color. Each HC/TR shall have a (6/6) strand Hybrid multi-mode/single-mode fiber optic cable run back to the BEF/IC/ER. Fiber Optic riser
2.5 Pathway Support System:

A. All horizontal cable shall be installed using a home-run configuration. Conduit, cable tray or "J" hooks are acceptable in any combination to support the cable system.

B. **NOTE:** In open ceiling environments, where cable is intentionally or unintentionally exposed to view, the cable **shall not be painted.**
   1. Cable should be protected from exposure to paint.
   2. Paint products may deteriorate the cable sheath and compromise the integrity of cable conductors.

C. Conduits shall be dedicated, using no smaller than a 3/4-in. inside diameter per workstation outlet. There shall be no daisy-chain conduit runs. Each workstation location shall require one 3/4-in. conduit, which is a home run back to the appropriate HC/TR or appropriate tray/support system.

D. Provide pull boxes in telecommunications conduit runs spaced not greater than 100 feet apart with no more than two right angle bends. If more than two bends are in any 100 foot section, increase the conduit by one trade size. See TIA/EIA- 569-A Section 4.4. Place a "TELECOMMUNICATIONS" label on all pull and junction boxes. If a cable tray system is installed, the conduit shall be a home run from the workstation outlet jack to the tray. Conduit runs shall not exceed 40% fill capacity and bend design as specified in TIA/EIA-569-A documents. Conduits should be sized appropriately.
   1. Workstation conduits **shall be dedicated** 1:1 ratio of conduit to workstation outlet.
   2. Workstation conduits **shall not be daisy chained** or shared between workstation outlets.
   3. Conduit runs shall have **no more than (2) right angle bends.**
   4. Conduit fill **shall not** exceed 40%.

E. Traditional nylon synch style Tie Wraps shall not be used to bundle cables. Velcro style Tie Wraps are the only acceptable method to secure cable bundles. See materials list. At no time shall pulling tension exceed 25 lbs on horizontal cables. Exceeding the maximum recommended pulling tension on Category 5E cables will compromise cable integrity. If wire integrity is compromised, the wire may not pass testing and certification standards required for a 1000BaseTX infrastructure. The installing contractor will be responsible for replacement of any cable system that does not meet required standards.

F. No intra/inter-building telecommunications cable shall be run adjacent and parallel to power cabling. A minimum of 5-in. distance is required from any fluorescent lighting fixture or power line up to 2kVA and 24-in. from any power line over 5kVA. Similarly, cable should be routed and terminated as far as possible from sources of EMF, such as generators, motors etc.

2.6 Grounding And Bonding

A. Telecommunications bonding and grounding are additional bonding and grounding
installed specifically for telecommunications systems. From a safety code standpoint, the NEC and NFPA 780 already cover such bonding and grounding; however, these codes are established primarily for safety. There are many situations where these codes can be interpreted or implemented in different ways. Some of these ways may not be as suitable as others for equipment protection, reliability, and performance.

1. Establishing a suitable telecommunications ground is critical in protecting and equalizing telecommunications equipment. A proper grounding and bonding infrastructure is essential for the reliable operation of today’s sensitive telecommunications equipment and systems. Telecommunications cabling and electrical power cabling must be effectively equalized.

2. The grounding and bonding infrastructure is to originate at the service entrance (electrical power) ground and extend throughout the building to each telecommunications room.

3. Building steel, neither water pipes, nor electrical service sub-panels are acceptable grounding points.

4. Grounding and Bonding shall conform to NEC Article 250 and TIA/EIA-607-A using a minimum conductor size of 6 AWG.
   a. Install a contiguous Intra-building grounding and bonding system in compliance with NEC Article 250 and TIA/EIA-607-A.
   b. Use a minimum conductor size of 6 AWG
   c. Install a grounding busbar on each plywood backboard in each telecommunications room as directed.
   d. The grounding and bonding system shall originate at the service entrance (electrical power) ground and be a contiguous intra-building bus.
   e. Bond all telecommunications equipment racks, backboards, conduits, and cable trays as specified in TIA/EIA-607.

PART 3 EXECUTION

3.1 Installation:

A. Install building structured wiring systems in accordance with manufacturer’s written instructions and with recognized industry practices.

3.2 Testing:

A. Testing is required in accordance with these specifications to determine that installation conforms to industry standards.

B. Testing reports shall be furnished to the owner.
GENERAL STRUCTURAL NOTES (G.S.N.)
ELECTRICAL PLAN REVIEW NOTES: APPROVED WITH CONDITIONS

Approval of the submitted documentation and drawings by an Electrical Plan Review does not alleviate the contractor or individuals from adherence to the 2017 National Electrical Code and local code requirements as they are adopted. Final approval will be based upon on-site Electrical Inspections.
Mechanical Plan Review: APPROVED

1. Please provide an air balance report for the exhaust and make up air systems serving the Shop/Garage area in order to verify adequate ventilation rates as per Table 403.3 of the 2012 IMC.

2. Final HVAC approval based upon on-site inspection for adherence to the 2012 IMC, 2012 IFGC, Idaho Statute Title 54 Chapter 50, stamped approved plans and manufacturers installation instructions.