

PROJECT MANUAL

Wolfe's Neck Woods State Park Freeport, Maine



Prepared by
Kaplan Thompson Architects

Wolfe's Neck Road
Freeport Maine 04032

Project Number BGS-3510

Department of Agriculture, Conservation and Forestry-Bureau of Parks and Lands

Issue for Bidding - 9/20/2024

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PART 1 - GENERAL

1.1 PROJECT MANUAL

A. VOLUME 1.

1. Wolfe's Neck Woods State Park.
2. Department of Agriculture, Conservation and Forestry.
3. Freeport, Maine.
4. Bureau of General Services Project No. 3510.
5. Architect Project No. BGS_WNP.
6. Kaplan Thompson Architects.
7. 102 Exchange Street.
8. Portland, Maine, 04101.
9. Phone: 207-842-2888.
10. Website: www.kaplanthompson.com.
11. Issued: 09/20/2024.
12. Copyright 2024 Kaplan Thompson Architects.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 000101

DOCUMENT 000107 - SEALS PAGE

PART 1 - GENERAL

1.1 DESIGN PROFESSIONALS OF RECORD

A. Architect Firm:

1. Kaplan Thompson Architects - Phil Kaplan.
2. ME 2567.
3. Responsible for Divisions 01-49 Sections except where indicated as prepared by other design professionals of record.

B. Civil Engineer:

1. Gorrill Palmer.
2. 8518.
3. Responsible for Site Plan, grading and drainage and associated details.

C. Structural Engineer:

1. Trillium Engineering.
2. 12851.
3. Responsible for Structural Design.

D. Mechanical Engineer, Plumbing:

1. Fuss & O'Neill.
2. 15418.
3. Responsible for Mechanical and Plumbing.

E. Electrical Engineer:

1. Swiftcurrent.
2. 9199.
3. Responsible for Power and Lighting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF DOCUMENT 000107

DOCUMENT 000115 - LIST OF DRAWING SHEETS

PART 1 - GENERAL

1.1 LIST OF DRAWINGS

- A. Drawings: Drawings that will be enumerated in the Owner/Contractor Agreement as part of the Contract Documents are listed on the Table of Contents page of the separately bound drawing set titled Wolfe's Neck Woods State Park, dated 9/20/2024, as modified by subsequent Addenda and Modifications.
 - 1. The words "Resource Drawing" or "For information" after the titles of drawings indicate that those drawings are not intended to be incorporated in the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF DOCUMENT 000115

00 11 13
Notice to Contractors

Wolfe's Neck Woods State Park

3510

Park Entrance Booth Replacement and Improvements

The cost of the work is approximately \$ 724,075. The contract shall designate the Substantial Completion Date on or before *16 May 2025*, and the Contract Final Completion Date on or before *30 June 2025*.

1. Submit bids on a completed Contractor Bid Form (section 00 41 13), provided in the Bid Documents, include bid security when required, and scan each item as an attachment to an email addressed to: BGS.Architect@Maine.gov, so as to be received no later than **2:00:00 p.m. on *Wednesday, 16 October 2024***. The email subject line shall be marked "**Bid for *Wolfe's Neck Woods State Park***".

Bid submissions will be opened and read aloud at the time and date noted above at the Bureau of General Services office, accessible as a video conference call. Those who wish to participate in the call must submit a request for access to BGS.Architect@Maine.gov.

Any bid received after the noted time will not be considered a valid bid and will remain unopened. Any bid submitted by any other means will not be considered a valid bid. In certain circumstances, the Bureau of General Services may require the Bidder to surrender a valid paper copy of the bid form or the bid security document. The Owner reserves the right to accept or reject any or all bids as may best serve the interest of the Owner.

2. Questions and comments on the *bid opening process* shall be addressed to: Division of Planning, Design & Construction, Bureau of General Services, 77 State House Station, Augusta, Maine 04333-0077, BGS.Architect@Maine.gov.
3. Questions and comments regarding the *project* design specifications or drawings shall be directed in writing to the Consultant during the bid period prior to the question and comment deadline of 5:00 p.m. on *Tuesday, 8 October 2024*.

Kaplan Thompson Architects
Adam Wallace, AIA
adam@kaplanthompson.com

4. ☒ Bid security is required on this project.
The Bidder shall include a satisfactory Bid Bond (section 00 43 13) or a certified or cashier's check for 5% of the bid amount with the completed bid form submitted to the Owner. The Bid Bond form is available on the BGS website.
or
☐ Bid security is not required on this project.

00 11 13
Notice to Contractors

5. ☒ Performance and Payment Bonds are required on this project.
If noted above as required, or if any combination of Base Bid and Alternate Bids amounts selected in the award of the contract exceeds \$125,000.00, the selected Contractor shall furnish a 100% contract Performance Bond (section 00 61 13.13) and a 100% contract Payment Bond (section 00 61 13.16) in the contract amount to cover the execution of the Work. Bond forms are available on the BGS website.
or
☐ Performance and Payment Bonds are not required on this project.
6. Filed Sub-bids *are not required* on this project.
7. ☐ Pre-qualified General Contractors are utilized on this project.
insert the company name, city and state for each
or
☒ Pre-qualified General Contractors are not utilized on this project.
8. ☒ An on-site pre-bid conference (☒ *mandatory* or ☐ *optional*) will be conducted for this project. The pre-bid conference is intended for General Contractors. Subcontractors and suppliers are welcome to attend. Contractors who arrive late or leave early for a mandatory meeting may be prohibited from participating in this meeting and bidding.
Thursday, 3 October 2024 at 10:00AM
Wolfe's Neck Woods State Park

or
☐ An on-site pre-bid conference will not be conducted for this project.
9. Bid Documents - full sets only - will be available on or about *Monday, 23 September 2024* and may be obtained *at no cost in electronic format* from:
adam@kaplanthompson.com
10. Bid Documents may be examined at:
- | | |
|---|--|
| <i>AGC Maine</i>
<i>188 Whitten Road, Augusta, ME 04330</i>
<i>207-622-4741</i> | <i>Construction Summary</i>
<i>734 Chestnut Street, Manchester, NH 03104</i>
<i>603-627-8856</i> |
|---|--|

00 21 13
Instructions to Bidders

1. Bidder Requirements

- 1.1 A bidder is a Contractor which is evidently qualified, or has been specifically pre-qualified by the Bureau of General Services, to bid on the proposed project described in the Bid Documents.
- 1.2 Contractors and Subcontractors bidding on projects that utilize Filed Sub-bids shall follow the requirements outlined in these Bid Documents for such projects. See Section 00 22 13 for additional information.
- 1.3 Contractors and Subcontractors are not eligible to bid on the project when their access to project design documents prior to the bid period distribution of documents creates an unfair bidding advantage. Prohibited access includes consultation with the Owner or with design professionals engaged by the Owner regarding cost estimating, constructability review, or project scheduling. This prohibition to bid applies to open, competitive bidding or pre-qualified contractor bidding or Filed Sub-bidding. The Bureau may require additional information to determine if the activities of a Contractor constitute an unfair bidding advantage.
- 1.4 Each bidder is responsible for becoming thoroughly familiar with the Bid Documents prior to submitting a bid. The failure of a bidder to review evident site conditions, to attend available pre-bid conferences, or to receive, examine, or act on addenda to the Bid Documents shall not relieve that bidder from any obligation with respect to their bid or the execution of the work as a Contractor.
- 1.5 Prior to the award of the contract, General Contractor bidders or Filed Sub-bidders may be required to provide documented evidence to the Owner or the Bureau showing compliance with the provisions of this section, their business experience, financial capability, or performance on previous projects.
- 1.6 The selected General Contractor bidder will be required to provide proof of insurance before a contract can be executed.
- 1.7 Contracts developed from this bid shall not be assigned, sublet or transferred without the written consent of the Owner.
- 1.8 By submitting a bid the Contractor attests that it has not been declared ineligible to bid on State of Maine projects. The Director of the Bureau of General Services may disallow award of this contract to any Contractor if there is evidence that the Contractor or any of its Subcontractors, through their own fault, have been terminated, suspended for cause, debarred from bidding, agreed to refrain from bidding as part of a settlement, have defaulted on a contract, or had a contract completed by another party.
- 1.9 The Contractor attests that it is not presently indicted for or otherwise criminally or civilly charged by a Federal, State or local government entity with commission of any of the following offenses and has not within a three-year period preceding this bid been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction, or contract under a public transaction, violation of Federal or State anti-trust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.

00 21 13
Instructions to Bidders

- 1.10 The Contractor shall not make any award or permit any award (subgrant or contract) at any tier to any party which is debarred or suspended or is otherwise excluded from or ineligible for participation in Federal assistance programs or State of Maine projects.
2. Authority of Owner
 - 2.1 The Owner reserves the right to accept or reject any or all bids as may best serve the interest of the Owner.
 - 2.2 Subject to the Owner's stated right to accept or reject any or all bids, the Contractor shall be selected on the basis of the lowest dollar value of an acceptable Base Bid, or any combination of Base Bid plus Alternate Bids, as well as other limited cost modifications the Owner determines may best serve the interests of the Owner. An acceptable bid is a duly submitted bid from a responsive and responsible bidder.
 - 2.3 The Owner reserves the right to require Bid Bonds or Performance and Payment Bonds for any project of any contract value.
3. Submitting Bids and Bid Requirements
 - 3.1 Each bid shall be submitted on the forms provided in the Bid Documents.
 - 3.2 Each bid shall be valid for a period of thirty calendar days following the Project bid closing date and time. The bid expiration date may be extended in unusual circumstances by mutual consent of the Bidder and the Owner. The bid amount shall not be modified due to the bid expiration date extension.
 - 3.3 Any provision contained in a bid which shows cost escalation, or any modification of schedule or other requirements shall not be accepted. Such a provision causes the bid to be invalid, or, at the discretion of the Owner and BGS, that element of the bid submission may be disregarded for the purpose of awarding the contract without that provision.
 - 3.4 Bidders shall include a Bid Bond or other approved bid security with the bid form submitted to the Owner when the bid form indicates such bid security is required. The bond value shall be 5% of the bid amount. The form of bond is shown in section 00 43 13.
 - 3.5 Bidders recognize that inclusion of contract bonds and the cost of those bonds is dependent on the awarded contract dollar value. Therefore, a Base Bid, or any combination of Base Bid plus Alternate Bids, as well as other limited cost modifications, resulting in a contract award shall include the cost of Performance and Payment Bonds in the submitted bid amount when the construction contract value is over \$125,000.00. Similarly, the cost of Performance and Payment Bonds is excluded in the submitted bid amount when the construction contract value is \$125,000.00 or less unless bonds are specifically required by the Bid Documents. When required for the project, the selected Contractor shall provide these bonds before a contract can be executed, pursuant to 14 M.R.S.A., Section 871, Public Works Contractors' Surety Bond Law of 1971, subsection 3. The form of bonds is shown in section 00 61 13.13 and 00 61 13.16.

00 21 13
Instructions to Bidders

- 3.6 Bidders may modify bids in writing, by the same means as the original bid submission, prior to the bid closing time. Such written amendments shall not disclose the amount of the initial bid. If so disclosed, the entire bid is considered invalid.
- 3.7 Bidders implicitly acknowledge all Addenda issued when they submit the bid form. By usual practice the Consultant shall not issue Addenda less than 72 hours prior to the bid closing time, to allow ample time for bidders to incorporate the information. However, some information, such as extending the bid due date and time, may be issued with shorter notice. Addenda shall be issued to all companies who are registered holders of Bid Documents.
- 3.8 A bid may be withdrawn without penalty if a written request by the bidder is presented to the Owner prior to the bid closing time. Such written withdrawal requests are subject to verification as required by the Bureau.
- A bid may be withdrawn without penalty after the bid closing time if, in the determination of the Bureau, evidence provided by the Contractor shows an apparent unintended error such as a miscalculation, or an erroneous number on estimating documents, was the cause of an inaccurate bid. The Bureau may allow withdrawal in consideration of the bid bond or, without utilizing a bid bond, if the Bureau considers documented evidence provided by the Contractor shows factual errors had been made on the bid form.
- 3.9 In the event State of Maine Offices unexpectedly close on the published date of a public bid opening in the location of that bid opening, prior to the time of the scheduled deadline, the new deadline for the public bid opening will be the following business day at the originally scheduled hour of the day, at the original location. Official closings are posted on the State of Maine government website.
- 3.10 The Owner may require, in a Notice of Intent to Award letter to the apparent low bidder, a Schedule of Values, Project Schedule, and List of Subcontractors and Suppliers as both a demonstration of capability of the Bidder and as a condition of award.
- 3.11 Projects which require a State of Maine wage determination will include that schedule as part of the Bid Documents. See section 00 73 46, if such rates are required.
- 3.12 Projects which require compliance with the Davis-Bacon Act are subject to the regulations contained the Code for Federal Regulations and the federal wage determination which is made a part of the Bid Documents. See section 00 73 46, if such rates are required.
- 3.13 The Owner is exempt from the payment of Maine State sales and use taxes as provided in 36 M.R.S. §1760 (1). The Contractor and Subcontractors shall not include taxes on exempt items in the construction contract.

00 41 13
Contractor Bid Form

Wolfe's Neck Woods State Park

3510

Bid Form submitted by: *email only to email address below*

Bid Administrator:

Paul R. Barber

BGS.Architect@Maine.gov

Bureau of General Services

111 Sewall Street, Cross State Office Building, 4th floor

77 State House Station

Augusta, Maine 04333-0077

Bidder:

Signature: _____

Printed name and
title: _____

Company name: _____

Mailing address: _____

City, state, zip code: _____

Phone number: _____

Email address: _____

State of
incorporation,
if a corporation: _____

List of all partners,
if a partnership: _____

The Bidder agrees, if the Owner offers to award the contract, to provide any and all bonds and certificates of insurance, as well as Schedule of Values, Project Schedule, and List of Subcontractors and Suppliers if required by the Owner, and to sign the designated Construction Contract within twelve calendar days after the date of notification of such acceptance, except if the twelfth day falls on a State of Maine government holiday or other closure day, or a Saturday, or a Sunday, in which case the aforementioned documents must be received before 12:00 noon on the first available business day following the holiday, other closure day, Saturday, or Sunday.

As a guarantee thereof, the Bidder submits, together with this bid, a bid bond or other acceptable instrument as and if required by the Bid Documents.

00 41 13
Contractor Bid Form

1. The Bidder, having carefully examined the *Wolfe's Neck Woods State Park* Project Manual dated 20 September 2024, prepared by Kaplan Thompson Architects, as well as Specifications, Drawings, and any Addenda, the form of contract, and the premises and conditions relating to the work, proposes to furnish all labor, equipment and materials necessary for and reasonably incidental to the construction and completion of this project for the **Base Bid** amount of:

\$ _____ .00

2. Allowances *are not included* on this project.

No Allowances

\$ 0.00

3. Alternate Bids *are included* on this project.

Alternate Bids are as shown below

Any dollar amount line below that is left blank by the Bidder shall be read as a bid of **\$0.00**.

1 Alternate No. 01 -Improvements to Access Road, Parking \$ _____ .00

2 Alternate No. 02 -Replacement of Bathroom Building \$ _____ .00

3 not used \$ _____ .00

4 not used \$ _____ .00

4. Bid security *is required* on this project.

If noted above as required, or if the Base Bid amount exceeds \$125,000.00, the Bidder shall include with this bid form a satisfactory Bid Bond (section 00 43 13) or a certified or cashier's check for 5% of the bid amount with this completed bid form submitted to the Owner.

5. Filed Sub-bids *are not required* on this project.

If noted above as required, the Bidder shall include with this bid form a list of each Filed Sub-bidder selected by the Bidder on the form provided (section 00 41 13F).

00 43 13
Contractor Bid Bond

Bond No.: insert bond number

We, the undersigned, insert company name of Contractor, select type of entity of insert name of municipality in the State of insert name of state as principal, and insert name of surety as Surety, are hereby held and firmly bound unto select title of obligee in the penal sum of five percent of the bid amount, for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns, signed this insert date, i.e.: 8th day of select month, select year, which is the same date as that of the first specified bid due date, or subsequent bid due date revised by addendum.

The condition of the above obligation is such that whereas the principal has submitted to the Owner, or State of Maine, to a certain bid, attached hereto and hereby made a part hereof, to enter into a contract in writing, for the construction of insert name of project as designated in the contract documents

Now therefore:

If said bid shall be rejected, or, in the alternate,

If said bid shall be accepted and the principal shall execute and deliver a contract in the form of contract attached hereto, properly completed in accordance with said bid, and shall furnish a bond for the faithful performance of said contract, and for the payment of all persons performing labor or furnishing material in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said bid, then this obligation shall be void.

Otherwise, the same shall remain in force and effect- it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received hereby stipulates and agrees that the obligation of said Surety and its bonds shall be in no way impaired or affected by any extension of the time within which the Obligee may accept such bid and said Surety does hereby waive notice of any such extension.

00 43 13
Contractor Bid Bond

In witness whereof, the principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set above.

Signed and sealed this *insert date, i.e.: 8th* day of *select month, select year*, which is the same date as that of the first specified bid due date, or subsequent bid due date revised by addendum.

Contractor

(Signature)

insert name and title

insert company name

insert address
insert city state zip code

Surety

(Signature)

insert name and title

insert company name

insert address
insert city state zip code

If Contractor is a partnership, all partners shall execute the bond. A power of attorney document indicating that it still is in full force and effect shall be provided by the person executing this bond.

State of Maine CONSTRUCTION CONTRACT

Large Construction Project

*This form is used when the Contract value is \$50,000 or greater.
The Project Manual, Specifications and Drawings, and any Addenda are considered part of this Contract.*

Agreement entered into by and between the contracting entity name hereinafter called the **Owner** and Contractor company name hereinafter called the **Contractor**.

BGS Project No.: number assigned by BGS

Other Project No.: _____

For the following Project: title of project as shown on bid documents at facility or campus name, municipality, Maine.

The Specifications and the Drawings have been prepared by Consultant firm name, acting as Professional-of-Record and named in the documents as the Consultant Architect or Engineer.

The *Owner* and *Contractor* agree as follows:

ARTICLE 1 COMPENSATION AND PAYMENTS

1.1 The Owner shall pay the Contractor to furnish all labor, equipment, materials and incidentals necessary for the construction of the Work described in the Specifications and shown on the Drawings the Contract Amount as shown below.

Base Bid	<u>\$0.00</u>
<u>Alternate Bid number and name or "no Alternates"</u>	<u>\$0.00</u>
<u>Alternate Bid number and name or "no Alternates"</u>	<u>\$0.00</u>
<u>Alternate Bid number and name or "no Alternates"</u>	<u>\$0.00</u>
<u>Alternate Bid number and name or "no Alternates"</u>	<u>\$0.00</u>
<u>Alternate Bid number and name or "no Alternates"</u>	<u>\$0.00</u>
Total Contract Amount	<u>\$0.00</u>

1.2 The Contractor's requisition shall contain sufficient detail and supporting information for the Owner to evaluate and support the payment requested.

1.2.1 Payments are due and payable twenty-five working days from the date of receipt of a Contractor requisition which is approved by the Owner.

1.2.2 Provisions for late payments are governed by 5 M.R.S. Chapter 144, *Payment of Invoices Received from Business Concerns*, and interest shall be calculated at 1% per month.

ARTICLE 2 COMMENCEMENT AND COMPLETION DATES

2.1 The Work of this Contract shall commence no sooner than the date this document is executed by the approval authority, or a subsequent date designated in the contract documents.

2.2 The Substantial Completion Date shall be _____.

2.3 The Work of this Contract shall be completed on or before the Contract Final Completion Date of _____.

2.4 The Contract Expiration Date shall be _____. (This date is the Owner's deadline for internal management of contract accounts. The Contract Expiration Date does not directly relate to any contract obligation of the Contractor.)

ARTICLE 3 INELIGIBLE BIDDER

3.1 By signing this contract the Contractor attests that it has not been declared ineligible to bid on State of Maine projects. The Bureau of General Services may disallow award of this contract to any Contractor if there is evidence that the Contractor or any of its Subcontractors, through their own fault, have been terminated, suspended for cause, debarred from bidding, agreed to refrain from bidding as part of a settlement, have defaulted on a contract, or had a contract completed by another party.

3.2 By signing this contract the Contractor attests that it is not presently indicted for or otherwise criminally or civilly charged by a Federal, State or local government entity with commission of any of the following offenses and has not within a three-year period preceding this bid been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction, or contract under a public transaction, violation of Federal or State anti-trust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.

3.3 The Contractor shall not make any award or permit any award (subgrant or contract) at any tier to any party which is debarred or suspended or is otherwise excluded from or ineligible for participation in Federal assistance programs or State of Maine projects.

ARTICLE 4 CONTRACTOR'S RESPONSIBILITIES

4.1 On this project, the Contractor shall furnish the Owner the appropriate contract bonds in the amount of 100% of the Contract Sum. Contract bonds are mandated if the Contract Sum exceeds \$125,000, or if bonds are specifically required by the Contract Documents.

4.2 The Contractor shall comply with all laws, codes and regulations applicable to the Work.

4.3 The Contractor shall acquire all permits and third-party approvals applicable to the Work not specifically identified as provided by the Owner. Costs for Contractor-provided permits and third-party approvals shall be included in the Contract Sum identified in Section 1.1 above.

4.4 The Contractor shall remain an independent agent for the duration of this Contract, shall not become an employee of the State of Maine, and shall assure that no State employee will be compensated by, or otherwise benefit from, this Contract.

4.5 The Contractor shall be responsible for any design cost, construction cost, or other cost incurred on the Project to the extent caused by the negligent acts, errors or omissions of the Contractor or their Subcontractors in the performance of Work under this Contract.

ARTICLE 5 OWNER'S RESPONSIBILITIES

5.1 The Owner shall provide full information about the objectives, schedule, constraints and existing conditions of the project. The Owner has established a budget with reasonable contingencies that meets the project requirements.

5.2 By signing this contract, the Owner attests that all State of Maine procurement requirements for this contract have been met, including the solicitation of competitive bids.

ARTICLE 6 INSTRUMENTS OF SERVICE

6.1 The Contractor's use of the drawings, specifications and other documents known as the Consultant's Instruments of Service is limited to the execution of the Contractor's scope of work of this project unless the Contractor receives the written consent of the Owner and Consultant for use elsewhere.

ARTICLE 7 MISCELLANEOUS PROVISIONS

7.1 This Contract shall be governed by the laws of the State of Maine.

7.2 The Owner and Contractor, respectively, bind themselves, their partners, successors, assigns and legal representatives to this Contract. Neither party to this Contract shall assign the Contract as a whole without written consent of the other party, which consent the Owner may withhold without cause.

7.3 Notwithstanding any other provision of this Agreement, if the Owner does not receive sufficient funds to fund this Agreement or funds are de-appropriated, or if the Owner does not receive legal authority from the Maine State Legislature or Maine Courts to expend funds intended for this Agreement, then the Owner is not obligated to make payment under this Agreement; provided, however, the Owner shall be obligated to pay for services satisfactorily performed prior to any such non-appropriation in accordance with the termination provisions of this Agreement. The Owner shall timely notify the Contractor of any non-appropriation and the effective date of the non-appropriation.

ARTICLE 8 CONTRACT DOCUMENTS

8.1 The Project Manual, Specifications and Drawings, and any Addenda, together with this agreement, form the contract. Each element is as fully a part of the Contract as if hereto attached or herein repeated.

8.2 Specifications: *indicate date of issuance of project manual*

8.3 Drawings: *note here or attach each sheet number and title*

8.4 Addenda: *note each addenda number and date, or "none"*

BGS Project No.: _____

The Contract is effective as of the date executed by the approval authority.

OWNER**CONTRACTOR**

Signature Date
name and title

name of contracting entity
address

telephone
email address

Signature Date
name and title

name of contractor company
address

telephone
email address
Vendor Number

Indicate the names of the review and approval individuals appropriate to the approval authority.

select proper approval authority	
Reviewed by:	Approved by:
_____ <i>Signature Date</i> <i>insert name</i>	_____ <i>Signature Date</i> <i>Robert Gurney, P.E.</i>
<i>Project Manager/ Contract Administrator</i>	<i>Chief Engineer, Bureau of General Services</i>

00 61 13.13
Contractor Performance Bond

Bond No.: insert bond number

We, the undersigned, insert company name of Contractor, select type of entity of insert name of municipality in the State of insert name of state as principal, and insert name of surety as Surety, are hereby held and firmly bound unto select title of obligee in the penal sum of the Contract Price \$ insert the Contract Price in numbers for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of the above obligation is such that if the principal shall promptly and faithfully perform the contract entered into this insert date, i.e.: 8th day of select month, select year, which is the same date as that of the notice of intent to award letter, or in the absence of such a letter, not later than the date the Owner signs the construction contract, for the construction of insert name of project as designated in the contract documents, then this obligation shall be null and void.

Otherwise, the same shall remain in force and effect- it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received hereby stipulates and agrees that the obligation of said Surety and its bonds shall be in no way impaired or affected by any extension of the time which the Obligee may accept during the performance of the contract and said Surety does hereby waive notice of any such extension.

00 61 13.13
Contractor Performance Bond

In witness whereof, the principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set above.

Signed and sealed this *insert date, i.e.: 8th* day of *select month, select year*, which is the same date as that of the notice of intent to award letter, or in the absence of such a letter, not later than the date the Owner signs the construction contract.

Contractor

(Signature)

insert name and title

insert company name

insert address

insert city state zip code

Surety

(Signature)

insert name and title

insert company name

insert address

insert city state zip code

If Contractor is a partnership, all partners shall execute the bond. A power of attorney document indicating that it still is in full force and effect shall be provided by the person executing this bond.

00 61 13.16
Contractor Payment Bond

Bond No.: insert bond number

We, the undersigned, insert company name of Contractor, select type of entity of insert name of municipality in the State of insert name of state as principal, and insert name of surety as Surety, are hereby held and firmly bound unto select title of obligee in the penal sum of the Contract Price \$ insert the Contract Price in numbers for the use and benefit of claimants, defined as an entity having a contract with the principal or with a subcontractor of the principal for labor, materials, or both labor and materials, used or reasonably required for use in the performance of the contract, for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and assigns.

The condition of the above obligation is such that if the principal shall promptly satisfy all claims and demands incurred for all labor and materials, used or required by the principal in connection with the work described in the contract entered into this insert date, i.e.: 8th day of select month, select year, which is the same date as that of the notice of intent to award letter, or in the absence of such a letter, not later than the date the Owner signs the construction contract, for the construction of insert name of project as designated in the contract documents, and shall fully reimburse the obligee for all outlay and expense with said obligee may incur in making good any default of said principal, then this obligation shall be null and void.

Otherwise, the same shall remain in force and effect- it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received hereby stipulates and agrees that the obligation of said Surety and its bonds shall be in no way impaired or affected by any extension of the time which the Obligee may accept during the performance of the contract and said Surety does hereby waive notice of any such extension.

00 61 13.16
Contractor Payment Bond

In witness whereof, the principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set above.

Signed and sealed this *insert date, i.e.: 8th* day of *select month, select year*, which is the same date as that of the notice of intent to award letter, or in the absence of such a letter, not later than the date the Owner signs the construction contract.

Contractor

(Signature)

insert name and title

insert company name

insert address

insert city state zip code

Surety

(Signature)

insert name and title

insert company name

insert address

insert city state zip code

If Contractor is a partnership, all partners shall execute the bond. A power of attorney document indicating that it still is in full force and effect shall be provided by the person executing this bond.

00 71 00
Definitions

1. Definitions

- 1.1 *Addendum*: A document issued by the Consultant that amends the Bid Documents. Addenda shall not be issued less than seventy-two hours prior to the specified bid opening time.
- 1.2 *Allowance*: A specified dollar amount for a particular scope of work or service included in the Work that is identified in the Bid Documents and included in each Bidder's Bid. The Contractor shall document expenditures for an Allowance during the Project. Any unused balance shall be credited to the Owner. The Contractor is responsible for notifying the Owner of anticipated expenses greater than the specified amount and the Owner is responsible for those additional expenses.
- 1.3 *Alternate Bid*: The Contractor's written offer of a specified dollar amount, submitted on the Bid Form, for the performance of a particular scope of work described in the Bid Documents. The Owner determines the low bidder based on the sum of the base Bid and any combination of Alternate Bids that the Owner selects.
- 1.4 *Architect*: A Consultant acting as, or supporting, the Professional-of-Record who is responsible for the design of the Project. Equivalent to "Consultant" in State of Maine contract forms.
- 1.5 *Architectural Supplemental Instruction (ASI)*: A written instruction from the Architect for the purpose of clarification of the Contract Documents. An ASI does not alter the Contract Price or Contract Time. ASIs may be responses to RFIs and shall be issued by the Architect in a timely manner to avoid any negative impact on the Schedule of the Work.
- 1.6 *Bid*: The Contractor's written offer of a specified dollar amount or amounts, submitted on a form included in the Bid Documents, for the performance of the Work. A Bid may include bonds or other requirements. A base Bid is separate and distinct from Alternate Bids, being the only cost component necessary for the award of the contract, and representing the minimum amount of Work that is essential for the functioning of the Project.
- 1.7 *Bid Bond*: The security designated in the Bid Documents, furnished by Bidders as a guaranty of good faith to enter into a contract with the Owner, should a contract be awarded to that Bidder.
- 1.8 *Bidder*: Any business entity, individual or corporation that submits a bid for the performance of the work described in the Bid Documents, acting directly or through a duly authorized representative. See also *Responsive and Responsible Bidder*.
- 1.9 *Bid Documents*: The drawings, procurement and contracting requirements, general requirements, and the written specifications -including all addenda, that a bidder is required to reference in the submission of a bid.
- 1.10 *Bureau*: The State of Maine Bureau of General Services, or BGS, in the Department of Administrative and Financial Services.
- 1.11 *Calendar days*: Consecutive days, as occurring on a calendar, taking into account each day of the week, month, year, and any religious, national or local holidays. Calendar days are used for changes in Contract Time.

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Definitions

- 1.12 *Certificate of Substantial Completion*: A document developed by the Consultant that describes the final status of the Work and establishes the date that the Owner may use the facility for its intended purpose. The Certificate of Substantial Completion may also include a provisional list of items - a "punch list" - remaining to be completed by the Contractor. The Certificate of Substantial Completion identifies the date from which the project warranty period commences.
- 1.13 *Certificate of Occupancy*: A document developed by a local jurisdiction such as the Code Enforcement Officer that grants permission to the Owner to occupy a building.
- 1.14 *Change Order (CO)*: A document that modifies the contract and establishes the basis of a specific adjustment to the Contract Price or the Contract Time, or both. Change Orders may address correction of omissions, errors, and document discrepancies, or additional requirements. Change Orders should include all labor, materials and incidentals required to complete the work described. A Change Order is not valid until signed by the Contractor, Owner and Consultant and approved by the Bureau.
- 1.15 *Change Order Proposal (COP) (see also Proposal)*: Contract change proposed by the Contractor regarding the contract amount, requirements, or time. The Contractor implements the work of a COP after it is accepted by all parties. Accepted COPs are incorporated into the contract by Change Order.
- 1.16 *Clerk of the Works*: The authorized representative of the Consultant on the job site. Clerk of the Works is sometimes called the Architect's representative.
- 1.17 *Construction Change Directive (CCD)*: A written order prepared by the Consultant and signed by the Owner and Consultant, directing a change in the Work prior to final agreement with the Contractor on adjustment, if any, in the Contract Price or Contract Time, or both.
- 1.18 *Contract*: A written agreement between the Owner and the successful bidder which obligates the Contractor to perform the work specified in the Contract Documents and obligates the Owner to compensate the Contractor at the mutually accepted sum, rates or prices.
- 1.19 *Contract Bonds (also known as Payment and Performance Bonds)*: The approved forms of security, furnished by the Contractor and their surety, which guarantee the faithful performance of all the terms of the contract and the payment of all bills for labor, materials and equipment by the Contractor.
- 1.20 *Contract Documents*: The drawings and written specifications (including all addenda), Standard General Conditions, and the contract (including all Change Orders subsequently incorporated in the documents).
- 1.21 *Contract Expiration Date*: Date determined by the Owner as a deadline for internal management of contract accounts. This allows time after the Contract Final Completion Date for processing the final Requisition for Payment. The Contract Expiration Date does not directly relate to any contract obligation of the Contractor.
- 1.22 *Contract Final Completion Date*: Point of time when the Work is fully completed in compliance with the Contract Documents, as certified by the Consultant. Final payment to the Contractor is due upon Final Completion of the Project.
- 1.23 *Contract Price*: The dollar amount of the construction contract, also called *Contract Sum*.

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Definitions

- 1.24 *Contract Time*: The designated duration of time to execute the Work of the contract, with a specific date for completion.
- 1.25 *Contractor*: Also called the "General Contractor" or "GC" the individual or entity undertaking the execution of the general contract work under the terms of the contract with the Owner, acting directly or through a duly authorized representative. The Contractor is responsible for the means, methods and materials utilized in the execution and completion of the Work.
- 1.26 *Consultant*: The Architect or Engineer acting as Professional-of-Record for the Project. The Consultant is responsible for the design of the Project.
- 1.27 *Drawings*: The graphic and pictorial portion of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.
- 1.28 *Engineer*: A Consultant acting as, or supporting, the Professional-of-Record who is responsible for the design of the Project. Equivalent to "Consultant" in State of Maine contract forms.
- 1.29 *Filed Sub-bid*: The designated major Subcontractor's (or, in some cases, Contractor's) written offer of a specified dollar amount or amounts, submitted on a form included in the Bid Documents, for the performance of a particular portion of the Work. A Filed Sub-bid may include bonds or other requirements.
- 1.30 *General Requirements*: The on-site overhead expense items the Contractor provides for the Project, typically including, but not limited to, building permits, construction supervision, Contract Bonds, insurance, field office, temporary utilities, rubbish removal, and site fencing. Overhead expenses of the Contractor's general operation are not included. Sometimes referred to as the Contractor's General Conditions.
- 1.31 *Owner*: The State agency which is represented by duly authorized individuals. The Owner is responsible for defining the scope of the Project and compensation to the Consultant and Contractor.
- 1.32 *Owner's Representative*: The individual or entity contracted by the Owner to be an advisor and information conduit regarding the Project.
- 1.33 *Overhead*: General and administrative expenses of the Contractor's principal and branch offices, including payroll costs and other compensation of Contractor employees, deductibles paid on any insurance policy, charges against the Contractor for delinquent payments, and costs related to the correction of defective work, and the Contractor's capital expenses, including interest on capital used for the work.
- 1.34 *Performance and Payment Bonds (also known as Contract Bonds)*: The approved forms of security, furnished by the Contractor and their surety, which guarantee the faithful performance of all the terms of the contract and the payment of all bills for labor, materials and equipment by the Contractor.
- 1.35 *Post-Bid Addendum*: Document issued by the Consultant that defines a potential Change Order prior to signing of the construction contract. The Post-Bid Addendum allows the Owner to negotiate

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Definitions

contract changes with the Bidder submitting the lowest valid bid, only if the negotiated changes to the Bid Documents result in no change or no increase in the bid price.

A Post-Bid Addendum may also be issued after a competitive construction Bid opening to those Bidders who submitted a Bid initially, for the purpose of rebidding the Project work without re-advertising.

- 1.36 *Project*: The construction project proposed by the Owner to be constructed according to the Contract Documents. The Project, a public improvement, may be tied logistically to other public improvements and other activities conducted by the Owner or other contractors.
- 1.37 *Proposal (see also Change Order Proposal)*: The Contractor's written offer submitted to the Owner for consideration containing a specified dollar amount or rate, for a specific scope of work, and including a schedule impact, if any. A proposal shall include all costs for overhead and profit. The Contractor implements the work of a Proposal after it is accepted by all parties. Accepted Proposals are incorporated into the contract by Change Order.
- 1.38 *Proposal Request (PR)*: An Owner's written request to the Contractor for a Change Order Proposal.
- 1.39 *Punch List*: A document that identifies the items of work remaining to be done by the Contractor at the Close Out of a Project. The Punch List is created as a result of a final inspection of the work only after the Contractor attests that all of the Work is in its complete and permanent status.
- 1.40 *Request For Information (RFI)*: A Contractor's written request to the Consultant for clarification, definition or description of the Work. RFIs shall be presented by the Contractor in a timely manner to avoid any negative impact on the Schedule of the Work.
- 1.41 *Request For Proposal (RFP)*: An Owner's written request to the Contractor for a Change Order Proposal.
- 1.42 *Requisition for Payment*: The document in which the Contractor certifies that the Work described is, to the best of the Contractor's knowledge, information and belief, complete and that all previous payments have been paid by the Contractor to Subcontractors and suppliers, and that the current requested payment is now due. See *Schedule of Values*.
- 1.43 *Responsive and Responsible Bidder*: A bidder who complies, when submitting a bid on a given project, with the following *responsive* standards, as required by the Bid Documents:
 - submits specific qualifications to bid the project, if required;
 - attends mandatory pre-bid conferences, if required;
 - submits a bid prior to the close of the bid period;
 - submits a complete bid form;
 - submits a bid without indications of intent contrary to the stated requirements;
 - submits other materials and information, such as bid security, as required;
 and, meets the following minimums regarding these *responsible* standards:
 - sustains a satisfactory record of project performance;
 - maintains a permanent place of business in a known physical location;
 - possesses the financial means for short- and long-term operations;
 - possesses the appropriate technical experience and capabilities;
 - employs adequate personnel and subcontractor resources;

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Definitions

maintains the equipment needed to perform the work;
complies with the proposed implementation schedule;
complies with the insurance and bonding requirements;
provides post-construction warranty coverage;
and other criteria which can be considered relevant to the contract.

- 1.44 *Retainage*: The amount, calculated at five percent (5%) of the contract value or a scheduled value, that the Owner shall withhold from the Contractor until the work or portion of work is declared substantially complete or otherwise accepted by the Owner. The Owner may, if requested, reduce the amount withheld if the Owner deems it desirable and prudent to do so. (See Title 5 M.R.S.A., Section 1746.)
- 1.45 *Sample*: A physical example provided by the Contractor which illustrates materials, equipment or workmanship and establishes standards by which the Work will be judged.
- 1.46 *Schedule of the Work*: The document prepared by the Contractor and approved by the Owner that specifies the dates on which the Contractor plans to begin and complete various parts of the Work, including dates on which information and approvals are required from the Owner.
- 1.47 *Schedule of Values*: The document prepared by the Contractor and approved by the Owner before the commencement of the Work that specifies the dollar values of discrete portions of the Work equal in sum to the contract amount. The Schedule of Values is used to document progress payments of the Work in regular (usually monthly) requisitions for payment. See *Requisition for Payment*.
- 1.48 *Shop Drawings*: The drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.
- 1.49 *Specifications*: The portion of the Contract Documents consisting of the written requirements of the Work for materials, equipment, systems, standards, workmanship, and performance of related services.
- 1.50 *Subcontractor*: An individual or entity undertaking the execution of any part of the Work by virtue of a written agreement with the Contractor or any other Subcontractor. Also, an individual or entity retained by the Contractor or any other Subcontractor as an independent contractor to provide the labor, materials, equipment or services necessary to complete a specific portion of the Work.
- 1.51 *Substantial Completion Date*: Point of time when the Work or a designated portion of the Work is sufficiently complete in compliance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended purpose without unscheduled disruption. Substantial Completion is documented by the date of the Certificate of Substantial Completion signed by the Owner and the Contractor.
- 1.52 *Superintendent*: The representative of the Contractor on the job site, authorized by the Contractor to receive and fulfill instructions from the Consultant.
- 1.53 *Surety*: The individual or entity that is legally bound with the Contractor and Subcontractor to insure the faithful performance of the contract and for the payment of the bills for labor, materials and equipment by the Contractor and Subcontractors.

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- 1.54 *Work*: The construction and services, whether completed or partially completed, including all labor, materials, equipment and services provided or to be provided by the Contractor and Subcontractors to fulfill the requirements of the Project as described in the Contract Documents.

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General Conditions

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General Conditions

1. Preconstruction Conference

- 1.1 The Contractor shall, upon acceptance of a contract and prior to commencing work, schedule a preconstruction conference with the Owner and Consultant. The purpose of this conference is as follows.
 - 1.1.1 Introduce all parties who have a significant role in the Project, including:
 - Owner (State agency or other contracting entity)
 - Owner's Representative
 - Consultant (Architect or Engineer)
 - Subconsultants
 - Clerk-of-the-works
 - Contractor (GC)
 - Superintendent
 - Subcontractors
 - Other State agencies
 - Construction testing company
 - Commissioning agent
 - Special Inspections agent
 - Bureau of General Services (BGS);
 - 1.1.2 Review the responsibilities of each party;
 - 1.1.3 Review any previously-identified special provisions of the Project;
 - 1.1.4 Review the Schedule of the Work calendar submitted by the Contractor to be approved by the Owner and Consultant;
 - 1.1.5 Review the Schedule of Values form submitted by the Contractor to be approved by the Owner and Consultant;
 - 1.1.6 Establish routines for Shop Drawing approval, contract changes, requisitions, et cetera;
 - 1.1.7 discuss jobsite issues;
 - 1.1.8 Discuss Project close-out procedures;
 - 1.1.9 Provide an opportunity for clarification of Contract Documents before work begins; and
 - 1.1.10 Schedule regular meetings at appropriate intervals for the review of the progress of the Work.

2. Intent and Correlation of Contract Documents

- 2.1 The intent of the Contract Documents is to describe the complete Project. The Contract Documents consist of various components; each component complements the others. What is shown as a requirement by any one component shall be inferred as a requirement on all corresponding components.
- 2.2 The Contractor shall furnish all labor, equipment and materials, tools, transportation, insurance, services, supplies, operations and methods necessary for, and reasonably incidental to, the construction and completion of the Project. Any work that deviates from the Contract Documents which appears to be required by the exigencies of construction or by inconsistencies in the Contract Documents, will be determined by the Consultant and authorized in writing by the Consultant, Owner and the Bureau prior to execution. The Contractor shall be responsible for requesting clarifying information where the intent of the Contract Documents is uncertain.
- 2.3 The Contractor shall not utilize any apparent error or omission in the Contract Documents to the disadvantage of the Owner. The Contractor shall promptly notify the Consultant in writing of such errors or omissions. The Consultant shall make any corrections or clarifications necessary in such a situation to document the true intent of the Contract Documents.

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General Conditions

3. Additional Drawings and Specifications

- 3.1 Upon the written request of the Contractor, the Owner shall provide, at no expense to the Contractor, up to five sets of printed Drawings and Specifications for the execution of the Work.
- 3.2 The Consultant shall promptly furnish to the Contractor revised Drawings and Specifications, for the area of the documents where those revisions apply, when corrections or clarifications are made by the Consultant. All such information shall be consistent with, and reasonably inferred from, the Contract Documents. The Contractor shall do no work without the proper Drawings and Specifications.

4. Ownership of Contract Documents

- 4.1 The designs represented on the Contract Documents are the property of the Consultant. The Drawings and Specifications shall not be used on other work without consent of the Consultant.

5. Permits, Laws, and Regulations

- 5.1 The Owner is responsible for obtaining any zoning approvals or other similar local project approvals necessary to complete the Work, unless otherwise specified in the Contract Documents.
- 5.2 The Owner is responsible for obtaining Maine Department of Environmental Protection, Maine Department of Transportation, or other similar state government project approvals necessary to complete the Work, unless otherwise indicated in the Contract Documents.
- 5.3 The Owner is responsible for obtaining any federal agency project approvals necessary to complete the Work, unless otherwise indicated in the Contract Documents.
- 5.4 The Owner is responsible for obtaining all easements for permanent structures or permanent changes in existing facilities.
- 5.5 The Contractor is responsible for obtaining and paying for all permits and licenses necessary for the implementation of the Work. The Contractor shall notify the Owner of any delays, variance or restrictions that may result from the issuing of permits and licenses.
- 5.6 The Contractor shall comply with all ordinances, laws, rules and regulations and make all required notices bearing on the implementation of the Work. In the event the Contractor observes disagreement between the Drawings and Specifications and any ordinances, laws, rules and regulations, the Contractor shall promptly notify the Consultant in writing. Any necessary changes shall be made as provided in the contract for changes in the work. The Contractor shall not perform any work knowing it to be contrary to such ordinances, laws, rules and regulations.
- 5.7 The Contractor shall comply with local, state and federal regulations regarding construction safety and all other aspects of the Work.
- 5.8 The Contractor shall comply with the Maine Code of Fair Practices and Affirmative Action, 5 M.R.S. §784 (2).

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General Conditions

6. Taxes

- 6.1 The Owner is exempt from the payment of Maine State sales and use taxes as provided in 36 M.R.S. §1760 (1). The Contractor and Subcontractors shall not include taxes on exempt items in the construction contract.
- 6.2 Section 1760 further provides in subsection 61 that sales to a construction contractor or its subcontractor of tangible personal property that is to be physically incorporated in, and become a permanent part of, real property for sale to or owned by the Owner, are exempt from Maine State sales and use taxes. Tangible personal property is defined in 36 M.R.S. §1752 (17).
- 6.3 The Contractor may contact Maine Revenue Services, 24 State House Station, Augusta, Maine 04333 for guidance on tax exempt regulations authorized by 36 M.R.S. §1760 and detailed in Rule 302 (18-125 CMR 302).

7. Labor and Wages

- 7.1 The Contractor shall conform to the labor laws of the State of Maine, and all other laws, ordinances, and legal requirements affecting the work in Maine.
- 7.2 The Consultant shall include a wage determination document prepared by the Maine Department of Labor in the Contract Documents for state-funded contracts in excess of \$50,000. The document shows the minimum wages required to be paid to each category of labor employed on the project.
- 7.3 On projects requiring a Maine wage determination, the Contractor shall submit monthly payroll records to the Owner ("the contracting agency") showing the name and occupation of all workers and all independent contractors employed on the project. The monthly submission must also include the Contractor's company name, the title of the project, hours worked, hourly rate or other method of remuneration, and the actual wages or other compensation paid to each person.
- 7.4 The Contractor shall not reveal, in the payroll records submitted to the Owner, personal information regarding workers and independent contractors, other than the information described above. Such information shall not include Social Security number, employee identification number, or employee address or phone number, for example.
- 7.5 The Contractor shall conform to Maine statute (39-A M.R.S. §105-A (6)) by providing to the Workers' Compensation Board a list of all subcontractors and independent contractors on the job site and a record of the entity to whom that subcontractor or independent contractor is directly contracted and by whom that subcontractor or independent contractor is insured for workers' compensation purposes.
- 7.6 The Contractor shall enforce strict discipline and good order among their employees at all times, and shall not employ any person unfit or unskilled to do the work assigned to them.
- 7.7 The Contractor shall promptly pay all employees when their compensation is due, shall promptly pay all others who have billed and are due for materials, supplies and services used in the Work, and shall promptly pay all others who have billed and are due for insurance, workers compensation coverage, federal and state unemployment compensation, and Social Security

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General Conditions

charges pertaining to this Project. Before final payments are made, the Contractor shall furnish to the Owner affidavits that all such payments described above have been made.

- 7.8 The Contractor may contact the Maine Department of Labor, 54 State House Station, Augusta, Maine 04333 for guidance on labor issues.
- 7.9 The Contractor may contact the Maine Workers' Compensation Board, 27 State House Station, Augusta, Maine 04333 for guidance on workers' compensation issues.

8. Indemnification

- 8.1 The Contractor shall indemnify and hold harmless the Owner and its officers and employees from and against any and all damages, liabilities, and costs, including reasonable attorney's fees, and defense costs, for any and all injuries to persons or property, including claims for violation of intellectual property rights, to the extent caused by the negligent acts or omissions of the Contractor, its employees, agents, officers or subcontractors in the performance of work under this Agreement. The Contractor shall not be liable for claims to the extent caused by the negligent acts or omissions of the Owner or for actions taken in reasonable reliance on written instructions of the Owner.
- 8.2 The Contractor shall notify the Owner promptly of all claims arising out of the performance of work under this Agreement by the Contractor, its employees or agents, officers or subcontractors.
- 8.3 This indemnity provision shall survive the termination of the Agreement, completion of the project or the expiration of the term of the Agreement.

9. Insurance Requirements

- 9.1 The Contractor shall provide, with each original of the signed Contract, an insurance certificate or certificates acceptable to the Owner and BGS. The Contractor shall submit insurance certificates to the Owner and BGS at the commencement of this Contract and at policy renewal or revision dates. The certificates shall identify the project name and BGS project number, and shall name the Owner as certificate holder and as additional insured for general liability and automobile liability coverages. The submitted forms shall contain a provision that coverage afforded under the insurance policies will not be canceled or materially changed unless at least ten days prior written notice by registered letter has been given to the Owner and BGS.
- 9.2 The Owner does not warrant or represent that the insurance required herein constitutes an insurance portfolio which adequately addresses all risks faced by the Contractor or its Subcontractors. The Contractor is responsible for the existence, extent and adequacy of insurance prior to commencement of work. The Contractor shall not allow any Subcontractor to commence work until all similar insurance required of the Subcontractor has been confirmed by the Contractor.
- 9.3 The Contractor shall procure and maintain primary insurance for the duration of the Project and, if written on a Claims-Made basis, shall also procure and maintain Extended Reporting Period (ERP) insurance for the period of time that any claims could be brought. The Contractor shall ensure that all Subcontractors they engage or employ will procure and maintain similar insurance

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General Conditions

in form and amount acceptable to the Owner and BGS. At a minimum, the insurance shall be of the types and limits set forth herein protecting the Contractor from claims which may result from the Contractor's execution of the Work, whether such execution be by the Contractor or by those employed by the Contractor or by those for whose acts they may be liable. All required insurance coverages shall be placed with carriers authorized to conduct business in the State of Maine by the Maine Bureau of Insurance.

- 9.3.1 The Contractor shall have Workers' Compensation insurance for all employees on the Project site in accordance with the requirements of the Workers' Compensation law of the State of Maine.

Minimum acceptable limits for Employer's Liability are:

Bodily Injury by Accident.....	\$500,000
Bodily Injury by Disease.....	\$500,000 Each Employee
Bodily Injury by Disease.....	\$500,000 Policy Limit

- 9.3.2 The Contractor shall have Commercial General Liability insurance providing coverage for bodily injury and property damage liability for all hazards of the Project including premise and operations, products and completed operations, contractual, and personal injury liabilities. The policy shall include collapse and underground coverage as well as explosion coverage if explosion hazards exist. Aggregate limits shall apply on a location or project basis. Minimum acceptable limits are:

General aggregate limit	\$2,000,000
Products and completed operations aggregate	\$1,000,000
Each occurrence limit.....	\$1,000,000
Personal injury aggregate	\$1,000,000

- 9.3.3 The Contractor shall have Automobile Liability insurance against claims for bodily injury, death or property damage resulting from the maintenance, ownership or use of all owned, non-owned and hired automobiles, trucks and trailers. Minimum acceptable limit is:

Any one accident or loss	\$500,000
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- 9.3.4 For the portion of a project which is new construction, the Contractor shall procure and maintain Builder's Risk insurance naming the Owner, Contractor, and any Subcontractor as insureds as their interest may appear. Covered causes of loss form shall be all Risks of Direct Physical Loss, endorsed to include flood, earthquake, transit and sprinkler leakage where sprinkler coverage is applicable. Unless specifically authorized in writing by the Owner, the limit of insurance shall not be less than the initial contract amount, for the portion of the project which is new construction, and coverage shall apply during the entire contract period and until the work is accepted by the Owner.

- 9.3.5 The Contractor shall have Owner's Protective Liability insurance for contract values \$50,000 and above, naming the Owner as the Named Insured. Minimum acceptable limits are:

General aggregate limit	\$2,000,000
Each occurrence limit.....	\$1,000,000

10. Contract Bonds

- 10.1 When noted as required in the Bid Documents, the Contractor shall provide to the Owner a Performance Bond and a Payment Bond, or "contract bonds", upon execution of the contract. Each bond value shall be for the full amount of the contract and issued by a surety company authorized to do business in the State of Maine as approved by the Owner. The bonds shall be

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executed on the forms furnished in the Bid Documents. The bonds shall allow for any subsequent additions or deductions of the contract.

- 10.2 The contract bonds shall continue in effect for one year after final acceptance of the contract to protect the Owner's interest in connection with the one year guarantee of workmanship and materials and to assure settlement of claims for the payment of all bills for labor, materials and equipment by the Contractor.

11. Patents and Royalties

- 11.1 The Contractor shall, for all time, secure for the Owner the free and undisputed right to the use of any patented articles or methods used in the Work. The expense of defending any suits for infringement or alleged infringement of such patents shall be borne by the Contractor. Awards made regarding patent suits shall be paid by the Contractor. The Contractor shall hold the Owner harmless regarding patent suits that may arise due to installations made by the Contractor, and to any awards made as a result of such suits.
- 11.2 Any royalty payments related to the work done by the Contractor for the Project shall be borne by the Contractor. The Contractor shall hold the Owner harmless regarding any royalty payments that may arise due to installations made by the Contractor.

12. Surveys, Layout of Work

- 12.1 The Owner shall furnish all property surveys unless otherwise specified.
- 12.2 The Contractor is responsible for correctly staking out the Work on the site. The Contractor shall employ a competent surveyor to position all construction on the site. The surveyor shall run the axis lines, establish correct datum points and check each line and point on the site to insure their accuracy. All such lines and points shall be carefully preserved throughout the construction.
- 12.3 The Contractor shall lay out all work from dimensions given on the Drawings. The Contractor shall take measurements and verify dimensions of any existing work that affects the Work or to which the Work is to be fitted. The Contractor is solely responsible for the accuracy of all measurements. The Contractor shall verify all grades, lines, levels, elevations and dimensions shown on the Drawings and report any errors or inconsistencies to the Consultant prior to commencing work.

13. Record of Documents

- 13.1 The Contractor shall maintain one complete set of Contract Documents on the jobsite, in good order and current status, for access by the Owner and Consultant.
- 13.2 The Contractor shall maintain, continuously updated, complete records of Requests for Information, Architectural Supplemental Instructions (or equivalent), Information Bulletins, supplemental sketches, Change Order Proposals, Change Orders, Shop Drawings, testing reports, et cetera, for access by the Owner and Consultant.

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14. Allowances

- 14.1 The Contract Price shall include all allowances described in the Contract Documents. The Contractor shall include all overhead and profit necessary to implement each allowance in their Contract Price.
- 14.2 The Contractor shall not be required to employ parties for allowance work against whom the Contractor has a reasonable objection. In such a case, the Contractor shall notify the Owner in writing of their position and shall propose an alternative party to complete the work of the allowance.

15. Shop Drawings

- 15.1 The Contractor shall administer Shop Drawings prepared by the Contractor, Subcontractors, suppliers or others to conform to the approved Schedule of the Work. The Contractor shall verify all field measurements, check and authorize all Shop Drawings and schedules required by the Work. The Contractor is the responsible party and contact for the Contractor's work as well as that of Subcontractors, suppliers or others who provide Shop Drawings.
- 15.2 The Consultant shall review and acknowledge Shop Drawings, with reasonable promptness, for general conformity with the design concept of the project and compliance with the information provided in the Contract Documents.
- 15.3 The Contractor shall provide monthly updated logs containing: requests for information, information bulletins, supplemental instructions, supplemental sketches, change order proposals, change orders, submittals, testing and deficiencies.
- 15.4 The Contractor shall make any corrections required by the Consultant, and shall submit a quantity of corrected copies as may be needed. The acceptance of Shop Drawings or schedules by the Consultant shall not relieve the Contractor from responsibility for deviations from Drawings and Specifications, unless the Contractor has called such deviations to the attention of the Consultant at the time of submission and secured the Consultant's written approval. The acceptance of Shop Drawings or schedules by the Consultant does not relieve the Contractor from responsibility for errors in Shop Drawings or schedules.

16. Samples

- 16.1 The Contractor shall furnish for approval, with reasonable promptness, all samples as directed by the Consultant. The Consultant shall review and approve such samples, with reasonable promptness, for general conformity with the design concept of the project and compliance with the information provided in the Contract Documents. The subsequent work shall be in accord with the approved samples.

17. Substitutions

- 17.1 The Contractor shall furnish items and materials described in the Contract Documents. If the item or material specified describes a proprietary product, or uses the name of a manufacturer, the term "or approved equal" shall be implied, if it is not included in the text. The specific item or material specified establishes a minimum standard for the general design, level of quality, type, function, durability, efficiency, reliability, compatibility, warranty coverage, installation factors

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and required maintenance. The Drawing or written Specification shall not be construed to exclude other manufacturers products of comparable design, quality, and efficiency.

- 17.2 The Contractor may submit detailed information about a proposed substitution to the Consultant for consideration. Particular models of items and particular materials which the Contractor asserts to be equal to the items and materials identified in the Contract Documents shall be allowed only with written approval by the Consultant. The request for substitution shall include a cost comparison and a reason or reasons for the substitution.
- 17.3 The Consultant may request additional information about the proposed substitution. The approval or rejection of a proposed substitution may be based on timeliness of the request, source of the information, the considerations of minimum standards described above, or other considerations. The Consultant should briefly state the rationale for the decision. The decision shall be considered final.
- 17.4 The duration of a substitution review process can not be the basis for a claim for delay in the Schedule of the Work.

18. Assignment of Contract

- 18.1 The Contractor shall not assign or sublet the contract as a whole without the written consent of the Owner. The Contractor shall not assign any money due to the Contractor without the written consent of the Owner.

19. Separate Contracts

- 19.1 The Owner reserves the right to create other contracts in connection with this Project using similar General Conditions. The Contractor shall allow the Owner's other contractors reasonable opportunity for the delivery and storage of materials and the execution of their work. The Contractor shall coordinate and properly connect the Work of all contractors.
- 19.2 The Contractor shall promptly report to the Consultant and Owner any apparent deficiencies in work of the Owner's other contractors that impacts the proper execution or results of the Contractor. The Contractor's failure to observe or report any deficiencies constitutes an acceptance of the Owner's other contractors work as suitable for the interface of the Contractor's work, except for latent deficiencies in the Owner's other contractors work.
- 19.3 Similarly, the Contractor shall promptly report to the Consultant and Owner any apparent deficiencies in their own work that would impact the proper execution or results of the Owner's other contractors.
- 19.4 The Contractor shall report to the Consultant and Owner any conflicts or claims for damages with the Owner's other contractors and settle such conflicts or claims for damages by mutual agreement or arbitration, if necessary, at no expense to the Owner.
- 19.5 In the event the Owner's other contractors sue the Owner regarding any damage alleged to have been caused by the Contractor, the Owner shall notify the Contractor, who shall defend such proceedings at the Contractor's expense. The Contractor shall pay or satisfy any judgment that may arise against the Owner, and pay all other costs incurred.

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20. Subcontracts

- 20.1 The Contractor shall not subcontract any part of this contract without the written permission of the Owner.
- 20.2 The Contractor shall submit a complete list of named Subcontractors and material suppliers to the Consultant and Owner for approval by the Owner prior to commencing work. The Subcontractors named shall be reputable companies of recognized standing with a record of satisfactory work.
- 20.3 The Contractor shall not employ any Subcontractor or use any material until they have been approved, or where there is reason to believe the resulting work will not comply with the Contract Documents.
- 20.4 The Contractor, not the Owner, is as fully responsible for the acts and omissions of Subcontractors and of persons employed by them, as the Contractor is for the acts and omissions of persons directly or indirectly employed by the Contractor.
- 20.5 Neither the Contract Documents nor any Contractor-Subcontractor contract shall indicate, infer or create any direct contractual relationship between any Subcontractor and the Owner.

21. Contractor-Subcontractor Relationship

- 21.1 The Contractor shall be bound to the Subcontractor by all the obligations in the Contract Documents that bind the Contractor to the Owner.
- 21.2 The Contractor shall pay the Subcontractor, in proportion to the dollar value of the work completed and requisitioned by the Subcontractor, the approved dollar amount allowed to the Contractor no more than seven days after receipt of payment from the Owner.
- 21.3 The Contractor shall pay the Subcontractor accordingly if the Contract Documents or the subcontract provide for earlier or larger payments than described in the provision above.
- 21.4 The Contractor shall pay the Subcontractor for completed and requisitioned subcontract work, less retainage, no more than seven days after receipt of payment from the Owner for the Contractor's approved Requisition for Payment, even if the Consultant fails to certify a portion of the Requisition for Payment for a cause not the fault of the Subcontractor.
- 21.5 The Contractor shall not make a claim for liquidated damages or penalty for delay in any amount in excess of amounts that are specified by the subcontract.
- 21.6 The Contractor shall not make a claim for services rendered or materials furnished by the Subcontractor unless written notice is given by the Contractor to the Subcontractor within ten calendar days of the day in which the claim originated.
- 21.7 The Contractor shall give the Subcontractor an opportunity to present and to submit evidence in any progress conference or disputes involving subcontract work.

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- 21.8 The Contractor shall pay the Subcontractor a just share of any fire insurance payment received by the Contractor.
- 21.9 The Subcontractor shall be bound to the Contractor by the terms of the Contract Documents and assumes toward the Contractor all the obligations and responsibilities that the Contractor, by those documents, assumes toward the Owner.
- 21.10 The Subcontractor shall submit applications for payment to the Contractor in such reasonable time as to enable the Contractor to apply for payment as specified.
- 21.11 The Subcontractor shall make any claims for extra cost, extensions of time or damages, to the Contractor in the manner provided in these General Conditions for like claims by the Contractor to the Owner, except that the time for the Subcontractor to make claims for extra cost is seven calendar days after the receipt of Consultant's instructions.

22. Supervision of the Work

- 22.1 During all stages of the Work the Contractor shall have a competent superintendent, with any necessary assistant superintendents, overseeing the project. The superintendent shall not be reassigned without the consent of the Owner unless a superintendent ceases to be employed by the Contractor due to unsatisfactory performance.
- 22.2 The superintendent represents the Contractor on the jobsite. Directives given by the Consultant or Owner to the superintendent shall be as binding as if given directly to the Contractor's main office. All important directives shall be confirmed in writing to the Contractor. The Consultant and Owner are not responsible for the acts or omissions of the superintendent or assistant superintendents.
- 22.3 The Contractor shall provide supervision of the Work equal to the industry's highest standard of care. The superintendent shall carefully study and compare all Contract Documents and promptly report any error, inconsistency or omission discovered to the Consultant. The Contractor may not necessarily be held liable for damages resulting directly from any error, inconsistency or omission in the Contract Documents or other instructions by the Consultant that was not revealed by the superintendent in a timely way.

23. Observation of the Work

- 23.1 The Contractor shall allow the Owner, the Consultant and the Bureau continuous access to the site for the purpose of observation of the progress of the work. All necessary safeguards and accommodations for such observations shall be provided by the Contractor.
- 23.2 The Contractor shall coordinate all required testing, approval or demonstration of the Work. The Contractor shall give sufficient notice to the appropriate parties of readiness for testing, inspection or examination.
- 23.3 The Contractor shall schedule inspections and obtain all required certificates of inspection for inspections by a party other than the Consultant.

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- 23.4 The Consultant shall make all scheduled observations promptly, prior to the work being concealed or buried by the Contractor. If approval of the Work is required of the Consultant, the Contractor shall notify the Consultant of the construction schedule in this regard. Work concealed or buried prior to the Consultant's approval may need to be uncovered at the Contractor's expense.
- 23.5 The Consultant may order reexamination of questioned work, and, if so ordered, the work must be uncovered by the Contractor. If the work is found to conform to the Contract Documents, the Owner shall pay the expense of the reexamination and remedial work. If the work is found to not conform to the Contract Documents, the Contractor shall pay the expense, unless the defect in the work was caused by the Owner's Contractor, whose responsibility the reexamination expense becomes.
- 23.6 The Bureau shall periodically observe the Work during the course of construction and make recommendations to the Contractor or Consultant as necessary. Such recommendations shall be considered and implemented through the usual means for changes to the Work.
24. Consultant's Status
- 24.1 The Consultant represents the Owner during the construction period, and observes the work in progress on behalf of the Owner. The Consultant has authority to act on behalf of the Owner only to the extent expressly provided by the Contract Documents or otherwise demonstrated to the Contractor. The Consultant has authority to stop the work whenever such an action is necessary, in the Consultant's reasonable opinion, to ensure the proper execution of the contract.
- 24.2 The Consultant is the interpreter of the conditions of the contract and the judge of its performance. The Consultant shall favor neither the Owner nor the Contractor, but shall use the Consultant's powers under the contract to enforce faithful performance by both parties.
- 24.3 In the event of the termination of the Consultant's employment on the project prior to completion of the work, the Owner shall appoint a capable and reputable replacement. The status of the new Consultant relative to this contract shall be that of the former Consultant.
25. Management of the Premises
- 25.1 The Contractor shall place equipment and materials, and conduct activities on the premises in a manner that does not unreasonably hinder site circulation, environmental stability, or any long term effect. Likewise, the Consultant's directions shall not cause the use of premises to be impeded for the Contractor or Owner.
- 25.2 The Contractor shall not use the premises for any purpose other than that which is directly related to the scope of work. The Owner shall not use the premises for any purpose incompatible with the proposed work simultaneous to the work of the Contractor.
- 25.3 The Contractor shall enforce the Consultant's instructions regarding information posted on the premises such as signage and advertisements, as well as activities conducted on the premises such as fires, and smoking.

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- 25.4 The Owner may occupy any part of the Project that is completed with the written consent of the Contractor, and without prejudice to any of the rights of the Owner or Contractor. Such use or occupancy shall not, in and of itself, be construed as a final acceptance of any work or materials.

26. Safety and Security of the Premises

- 26.1 The Contractor shall designate, and make known to the Consultant and the Owner, a safety officer whose duty is the prevention of accidents on the site.
- 26.2 The Contractor shall continuously maintain security on the premises and protect from unreasonable occasion of injury all people authorized to be on the job site. The Contractor shall also effectively protect the property and adjacent properties from damage or loss.
- 26.3 The Contractor shall take all necessary precautions to ensure the safety of workers and others on and adjacent to the site, abiding by applicable local, state and federal safety regulations. The Contractor shall erect and continuously maintain safeguards for the protection of workers and others, and shall post signs and other warnings regarding hazards associated with the construction process, such as protruding fasteners, moving equipment, trenches and holes, scaffolding, window, door or stair openings, and falling materials.
- 26.4 The Contractor shall restore the premises to conditions that existed prior to the start of the project at areas not intended to be altered according to the Contract Documents.
- 26.5 The Contractor shall protect existing utilities and exercise care working in the vicinity of utilities shown in the Drawings and Specifications or otherwise located by the Contractor.
- 26.6 The Contractor shall protect from damage existing trees and other significant plantings and landscape features of the site which will remain a permanent part of the site. If necessary or indicated in the Contract Documents, tree trunks shall be boxed and barriers erected to prevent damage to tree branches or roots.
- 26.7 The Contractor shall repair or replace damage to the Work caused by the Contractor's or Subcontractor's forces, including that which is reasonably protected, at the expense of the responsible party.
- 26.8 The Contractor shall not load, or allow to be loaded, any part of the Project with a force which imperils personal or structural safety. The Consultant may consult with the Contractor on such means and methods of construction, however, the ultimate responsibility lies with the Contractor.
- 26.9 The Contractor shall not jeopardize any work in place with subsequent construction activities such as blasting, drilling, excavating, cutting, patching or altering work. The Consultant must approve altering any structural components of the project. The Contractor shall supervise all construction activities carried out by others on site to ensure that the work is neatly done and in a manner that will not endanger the structure or the component parts.
- 26.10 The Contractor may act with their sole discretion in emergency situations that potentially effect health, life or serious damage to the premises or adjacent properties, to prevent such potential loss or injury. The Contractor may negotiate with the Owner for compensation for expenses due to such emergency work.

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- 26.11 The Contractor and Subcontractors shall have no responsibility for the identification, discovery, presence, handling, removal or disposal of, or exposure of persons to, hazardous materials in any form at the project site. The Contractor shall avoid disruption of any hazardous materials or toxic substances at the project site and promptly notify the Owner in writing on the occasion of such a discovery.
- 26.12 The Contractor shall keep the premises free of any unsafe accumulation of waste materials caused by the work. The Contractor shall regularly keep the spaces "broom clean". See the Close-out of the Work provisions of this section regarding cleaning at the completion of the project.

27. Changes in the Work

- 27.1 The Contractor shall not proceed with extra work without an approved Change Order or Construction Change Directive. A Change Order which has been properly signed by all parties shall become a part of the contract.
- 27.2 A Change Order is the usual document for directing changes in the Work. In certain circumstances, however, the Owner may utilize a Construction Change Directive to direct the Contractor to perform changes in the Work that are generally consistent with the scope of the project. The Owner shall use a Construction Change Directive only when the normal process for approving changes to the Work has failed to the detriment of the Project, or when agreement on the terms of a Change Order cannot be met, or when an urgent situation requires, in the Owner's judgment, prompt action by the Contractor.
- 27.3 The Consultant shall prepare the Construction Change Directive representing a complete scope of work, with proposed Contract Price and Contract Time revisions, if any, clearly stated.
- 27.4 The Contractor shall promptly carry out a Construction Change Directive which has been signed by the Owner and the Consultant. Work thus completed by the Contractor constitutes the basis for a Change Order. Changes in the Contract Price and Contract Time shall be as defined in the Construction Change Directive unless subsequently negotiated with some other terms.
- 27.5 The method of determining the dollar value of extra work shall be by:
- .1 an estimate of the Contractor accepted by Owner as a lump sum, or
 - .2 unit prices named in the contract or subsequently agreed upon, or
 - .3 cost plus a designated percentage, or
 - .4 cost plus a fixed fee.
- 27.6 The Contractor shall determine the dollar value of the extra work for both the lump sum and cost plus designated percentage methods so as not to exceed the following rates. The rates include all overhead and profit expenses.
- .1 Contractor - for any work performed by the Contractor's own forces, up to 20% of the cost;
 - .2 Subcontractor - for work performed by Subcontractor's own forces, up to 20% of the cost;
 - .3 Contractor - for work performed by Contractor's Subcontractor, up to 10% of the amount due the Subcontractor.
- 27.7 The Contractor shall keep and provide records as needed or directed for the cost plus designated percentage method. The Consultant shall review and certify the appropriate amount which

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includes the Contractor's overhead and profit. The Owner shall make payments based on the Consultant's certificate.

- 27.8 Cost reflected in Change Orders shall be limited to the following: cost of materials, cost of delivery, cost of labor (including Social Security, pension, Workers' Compensation insurance, and unemployment insurance), and cost of rental of power tools and equipment. Labor cost may include a pro-ratio share of a foreman's time only in the case of an extension of contract time granted due to the Change Order.
- 27.9 Overhead reflected in Change Orders shall be limited to the following: bond premium, supervision, wages of clerks, time keepers, and watchmen, small tools, incidental expenses, general office expenses, and all other overhead expenses directly related to the Change Order.
- 27.10 The Contractor shall provide credit to the Owner for labor, materials, equipment and other costs but not overhead and profit expenses for those Change Order items that result in a net value of credit to the contract.
- 27.11 The Owner may change the scope of work of the Project without invalidating the contract. The Owner shall notify the Contractor of a change of the scope of work for the Owner's Contractors, which may affect the work of this Contractor, without invalidating the contract. Change Orders for extension of the time caused by such changes shall be developed at the time of directing the change in scope of work.
- 27.12 The Consultant may order minor changes in the Work, not involving extra cost, which is consistent with the intent of the design or project.
- 27.13 The Contractor shall immediately give written notification to the Consultant of latent conditions discovered at the site which materially differ from those represented in the Drawings or Specifications, and which may eventually result in a change in the scope of work. The Contractor shall suspend work until receiving direction from the Consultant. The Consultant shall promptly investigate the conditions and respond to the Contractor's notice with direction that avoids any unnecessary delay of the Work. The Consultant shall determine if the discovered conditions warrant a Change Order.
- 27.14 The Contractor shall, within ten calendar days of receipt of the information, give written notification to the Consultant if the Contractor claims that instructions by the Consultant will constitute extra cost not accounted for by Change Order or otherwise under the contract. The Consultant shall promptly respond to the Contractor's notice with direction that avoids any unnecessary delay of the Work. The Consultant shall determine if the Contractor's claim warrants a Change Order.
28. Correction of the Work
- 28.1 The Contractor shall promptly remove from the premises all work the Consultant declares is non-conforming to the contract. The Contractor shall replace the work properly at no expense to the Owner. The Contractor is also responsible for the expenses of others whose work was damaged or destroyed by such remedial work.

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- 28.2 The Owner may elect to remove non-conforming work if it is not removed by the Contractor within a reasonable time, that time defined in a written notice from the Consultant. The Owner may elect to store removed non-conforming work not removed by the Contractor at the Contractor's expense. The Owner may, with ten days written notice, dispose of materials which the Contractor does not remove. The Owner may sell the materials and apply the net proceeds, after deducting all expenses, to the costs that should have been borne by the Contractor.
- 28.3 The Contractor shall remedy any defects due to faulty materials or workmanship and pay for any related damage to other work which appears within a period of one year from the date of substantial completion, and in accord with the terms of any guarantees provided in the contract. The Owner shall promptly give notice of observed defects to the Contractor and Consultant. The Consultant shall determine the status of all claimed defects. The Contractor shall perform all remedial work without unjustifiable delay in either the initial response or the corrective action.
- 28.4 The Consultant may authorize, after a reasonable notification to the Contractor, an equitable deduction from the contract amount in lieu of the Contractor correcting non-conforming or defective work.
29. Owner's Right to do Work
- 29.1 The Owner may, using other contractors, correct deficiencies attributable to the Contractor, or complete unfinished work. Such action shall take place only after giving the Contractor three days written notice, and provided the Consultant approves of the proposed course of action as an appropriate remedy. The Owner may then deduct the cost of the remedial work from the amount due the Contractor.
- 29.2 The Owner may act with their sole discretion when the Contractor is unable to take action in emergency situations that potentially effect health, life or serious damage to the premises or adjacent properties, to prevent such potential loss or injury. The Owner shall inform the Contractor of the emergency work performed, particularly where it may affect the work of the Contractor.
30. Termination of Contract and Stop Work Action
- 30.1 The Owner may, owing to a certificate of the Consultant indicating that sufficient cause exists to justify such action, without prejudice to any other right or remedy and after giving the Contractor and the Contractor's surety seven days written notice, terminate the employment of the Contractor. At that time the Owner may take possession of the premises and of all materials,

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tools and appliances on the premises and finish the work by whatever method the Owner may deem expedient. Cause for such action by the Owner includes:

- .1 the contractor is adjudged bankrupt, or makes a general assignment for the benefit of its creditors, or
- .2 a receiver is appointed due to the Contractor's insolvency, or
- .3 the Contractor persistently or repeatedly refuses or fails to provide enough properly skilled workers or proper materials, or
- .4 the Contractor fails to make prompt payment to Subcontractors or suppliers of materials or labor, or
- .5 the Contractor persistently disregards laws, ordinances or the instructions of the Consultant, or is otherwise found guilty of a substantial violation of a provision of the Contract Documents.

- 30.2 The Contractor is not entitled, as a consequence of the termination of the employment of the Contractor as described above, to receive any further payment until the Work is finished. If the unpaid balance of the contract amount exceeds the expense of finishing the Work, including compensation for additional architectural, managerial and administrative services, such balance shall be paid to the Contractor. If the expense of finishing the Work exceeds the unpaid balance, the Contractor shall pay the difference to the Owner. The Consultant shall certify the expense incurred by the Contractor's default. This obligation for payment shall continue to exist after termination of the contract.
- 30.3 The Contractor may, if the Work is stopped by order of any court or other public authority for a period of thirty consecutive days, and through no act or fault of the Contractor or of anyone employed by the Contractor, with seven days written notice to the Owner and the Consultant, terminate this contract. The Contractor may then recover from the Owner payment for all work executed, any proven loss and reasonable profit and damage.
- 30.4 The Contractor may, if the Consultant fails to issue a certificate for payment within seven days after the Contractor's formal request for payment, through no fault of the Contractor, or if the Owner fails to pay to the Contractor within 30 days after submission of any sum certified by the Consultant, with seven days written notice to the Owner and the Consultant, stop the Work or terminate this Contract.

31. Delays and Extension of Time

- 31.1 The completion date of the contract shall be extended if the work is delayed by changes ordered in the work which have approved time extensions, or by an act or neglect of the Owner, the Consultant, or the Owner's Contractor, or by strikes, lockouts, fire, flooding, unusual delay in transportation, unavoidable casualties, or by other causes beyond the Contractor's control. The Consultant shall determine the status of all claimed causes.
- 31.2 The contract shall not be extended for delay occurring more than seven calendar days before the Contractor's claim made in writing to the Consultant. In case of a continuing cause of delay, only one claim is necessary.
- 31.3 The contract shall not be extended due to failure of the Consultant to furnish drawings if no schedule or agreement is made between the Contractor and the Consultant indicating the dates

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which drawings shall be furnished and fourteen calendar days has passed after said date for such drawings.

- 31.4 This article does not exclude the recovery of damages for delay by either party under other provisions in the Contract Document.

32. Payments to the Contractor

- 32.1 As noted under *Preconstruction Conference* in this section, the Contractor shall submit a Schedule of Values form, before the first application for payment, for approval by the Owner and Consultant. The Consultant may direct the Contractor to provide evidence that supports the correctness of the form. The approved Schedule of Values shall be used as a basis for payments.
- 32.2 The Contractor shall submit an application for each payment ("Requisition for Payment") on a form approved by the Owner and Consultant. The Consultant may require receipts or other documents showing the Contractor's payments for materials and labor, including payments to Subcontractors.
- 32.3 The Contractor shall submit Requisitions for Payment as the work progresses not more frequently than once each month, unless the Owner approves a more frequent interval due to unusual circumstances. The Requisition for Payment is based on the proportionate quantities of the various classes of work completed or incorporated in the Work, in agreement with the actual progress of the Work and the dollar value indicated in the Schedule of Values.
- 32.4 The Consultant shall verify and certify each Requisition for Payment which appears to be complete and correct prior to payment being made by the Owner. The Consultant may certify an appropriate amount for materials not incorporated in the Work which have been delivered and suitably stored at the site. The Contractor shall submit bills of sale, insurance certificates, or other such documents that will adequately protect the Owner's interests prior to payments being certified.
- 32.5 In the event any materials delivered but not yet incorporated in the Work have been included in a certified Requisition for Payment with payment made, and said materials thereafter are damaged, deteriorated or destroyed, or for any reason whatsoever become unsuitable or unavailable for use in the Work, the full amount previously allowed shall be deducted from subsequent payments unless the Contractor satisfactorily replaces said material.
- 32.6 The Contractor may request certification of an appropriate dollar amount for materials not incorporated in the Work which have been delivered and suitably stored away from the site. The Contractor shall submit bills of sale, insurance certificates, right-of-entry documents or other such documents that will adequately protect the Owner's interests. The Consultant shall determine if the Contractor's documentation for the materials is complete and specifically designated for the Project. The Owner may allow certification of such payments.
- 32.7 Subcontractors may request, and shall receive from the Consultant, copies of approved Requisitions for Payment showing the amounts certified in the Schedule of Values.
- 32.8 Certified Requisitions for Payment, payments made to the Contractor, or partial or entire occupancy of the project by the Owner shall not constitute an acceptance of any work that does

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not conform to the Contract Documents. The making and acceptance of the final payment constitutes a waiver of all claims by the Owner, other than those arising from unsettled liens, from faulty work or materials appearing within one year from final payment or from requirements of the Drawings and Specifications, and of all claims by the Contractor, except those previously made and still unsettled.

33. Payments Withheld

- 33.1 The Owner shall retain five percent of each payment due the Contractor as part security for the fulfillment of the contract by the Contractor. The Owner may make payment of a portion of this “retainage” to the Contractor temporarily or permanently during the progress of the Work. The Owner may thereafter withhold further payments until the full amount of the five percent is reestablished. The Contractor may deposit with the Maine State Treasurer certain securities in place of retainage amounts due according to Maine Statute (5 M.R.S. §1746).
- 33.2 The Consultant may withhold or nullify the whole or a portion of any Requisitions for Payment submitted by the Contractor in the amount that may be necessary, in his reasonable opinion, to protect the Owner from loss due to any of the following:
- .1 defective work not remedied;
 - .2 claims filed or reasonable evidence indicating probable filing of claims;
 - .3 failure to make payments properly to Subcontractors or suppliers;
 - .4 a reasonable doubt that the contract can be completed for the balance then unpaid;
 - .5 liability for damage to another contractor.

The Owner shall make payment to the Contractor, in the amount withheld, when the above circumstances are removed.

34. Liens

- 34.1 The Contractor shall deliver to the Owner a complete release of all liens arising out of this contract before the final payment or any part of the retainage payment is released. The Contractor shall provide with the release of liens an affidavit asserting each release includes all labor and materials for which a lien could be filed. Alternately, the Contractor, in the event any Subcontractor or supplier refuses to furnish a release of lien in full, may furnish a bond satisfactory to the Owner, to indemnify the Owner against any lien.
- 34.2 In the event any lien remains unsatisfied after all payments to the Contractor are made by the Owner, the Contractor shall refund to the Owner all money that the latter may be compelled to pay in discharging such lien, including all cost and reasonable attorney’s fees.

35. Workmanship

- 35.1 The Contractor shall provide materials, equipment, and installed work equal to or better than the quality specified in the Contract Documents and approved in submittal and sample. The installation methods shall be of the highest standards, and the best obtainable from the respective trades. The Consultant’s decision on the quality of work shall be final.

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- 35.2 The Contractor shall know local labor conditions for skilled and unskilled labor in order to apply the labor appropriately to the Work. All labor shall be performed by individuals well skilled in their respective trades.
- 35.3 The Contractor shall perform all cutting, fitting, patching and placing of work in such a manner to allow subsequent work to fit properly, whether that be by the Contractor, the Owner's Contractors or others. The Owner and Consultant may advise the Contractor regarding such subsequent work. Notwithstanding the notification or knowledge of such subsequent work, the Contractor may be directed to comply with this standard of compatible construction by the Consultant at the Contractor's expense.
- 35.4 The Contractor shall request clarification or revision of any design work by the Consultant, prior to commencing that work, in a circumstance where the Contractor believes the work cannot feasibly be completed at the highest quality, or as indicated in the Contract Documents. The Consultant shall respond to such requests in a timely way, providing clarifying information, a feasible revision, or instruction allowing a reduced quality of work. The Contractor shall follow the direction of the Consultant regarding the required request for information.
- 35.5 The Contractor shall guarantee the Work against any defects in workmanship and materials for a period of one year commencing with the date of the Certificate of Substantial Completion, unless specified otherwise for specific elements of the project. The Work may also be subdivided in mutually agreed upon components, each defined by a separate Certificate of Substantial Completion.
36. Close-out of the Work
- 36.1 The Contractor shall remove from the premises all waste materials caused by the work. The Contractor shall make the spaces "broom clean" unless a more thorough cleaning is specified. The Contractor shall clean all windows and glass immediately prior to the final inspection, unless otherwise directed.
- 36.2 The Owner may conduct the cleaning of the premises where the Contractor, duly notified by the Consultant, fails to adequately complete the task. The expense of this cleaning may be deducted from the sum due to the Contractor.
- 36.3 The Contractor shall participate in all final inspections and acknowledge the documentation of unsatisfactory work, customarily called the "punch list", to be corrected by the Contractor. The Consultant shall document the successful completion of the Work in a dated Certificate of Substantial Completion, to be signed by Owner, Consultant, and Contractor.
- 36.4 The Contractor shall not call for final inspection of any portion of the Work that is not completely and permanently installed. The Contractor may be found liable for the expenses of individuals called to final inspection meetings prematurely.
- 36.5 The Contractor and all major Subcontractors shall participate in the end-of-warranty-period conference, typically scheduled close to one year after the Substantial Completion date.

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37. Date of Completion and Liquidated Damages

- 37.1 The Contractor may make a written request to the Owner for an extension or reduction of time, if necessary. The request shall include the reasons the Contractor believes justifies the proposed completion date. The Owner may grant the revision of the contract completion date if the Work was delayed due to conditions beyond the control and the responsibility of the Contractor. The Contractor shall not conduct unauthorized accelerated work or file delay claims to recover alleged damages for unauthorized early completion.
- 37.2 The Contractor shall vigorously pursue the completion of the Work and notify the Owner of any factors that have, may, or will affect the approved Schedule of the Work. The Contractor may be found responsible for expenses of the Owner or Consultant if the Contractor fails to make notification of project delays.
- 37.3 The Project is planned to be done in an orderly fashion which allows for an iterative submittal review process, construction administration including minor changes in the Work and some bad weather. The Contractor shall not file delay claims to recover alleged damages on work the Consultant determines has followed the expected rate of progress.
- 37.4 The Consultant shall prepare the Certificate of Substantial Completion which, when signed by the Owner and the Contractor, documents the date of Substantial Completion of the Work or a designated portion of the Work. The Owner shall not consider the issuance of a Certificate of Occupancy by an outside authority a prerequisite for Substantial Completion if the Certificate of Occupancy cannot be obtained due to factors beyond the Contractor's control.
- 37.5 Liquidated Damages may be deducted from the sum due to the Contractor for each calendar day that the Work remains uncompleted after the completion date specified in the Contract or an approved amended completion date. The dollar amount per day shall be calculated using the Schedule of Liquidated Damages table shown below.

If the original contract amount is:	The per day Liquidated Damages shall be:
Less than \$100,000	\$250
\$100,000 to less than \$2,000,000	\$750
\$2,000,000 to less than \$10,000,000	\$1,500
\$10,000,000 and greater	\$1,500 plus \$250 for each \$2,000,000 over \$10,000,000

38. Dispute Resolution

38.1 Mediation

- 38.1.1 A dispute between the parties which arises under this Contract which cannot be resolved through informal negotiation, shall be submitted to a neutral mediator jointly selected by the parties.
- 38.1.2 Either party may file suit before or during mediation if the party, in good faith, deems it to be necessary to avoid losing the right to sue due to a statute of limitations. If suit is filed before good faith mediation efforts are completed, the party filing suit shall agree to stay all proceedings in the lawsuit pending completion of the mediation process, provided such stay is without prejudice.

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38.1.3 In any mediation between the Owner and the Consultant, the Owner has the right to consolidate related claims between Owner and Contractor.

38.2 Arbitration

38.2.1 If the dispute is not resolved through mediation, the dispute shall be settled by arbitration. The arbitration shall be conducted before a panel of three arbitrators. Each party shall select one arbitrator; the third arbitrator shall be appointed by the arbitrators selected by the parties. The arbitration shall be conducted in accordance with the Maine Uniform Arbitration Act (MUAA), except as otherwise provided in this section.

38.2.2 The decision of the arbitrators shall be final and binding upon all parties. The decision may be entered in court as provided in the MUAA.

38.2.3 The costs of the arbitration, including the arbitrators' fees shall be borne equally by the parties to the arbitration, unless the arbitrator orders otherwise.

38.2.4 In any arbitration between the Owner and the Consultant, the Owner has the right to consolidate related claims between Owner and Contractor.

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Notice: The contract or delivery order to which this addendum is attached is made using federal assistance provided to the State of Maine by the US Department of Treasury under the American Rescue Plan Act ("ARPA"), Sections 602 and 603 of the Social Security Act, [Pub. L. No. 117-2 \(March 11, 2021\)](#).

1. Equal Opportunity

The Contractor shall comply with [Executive Order 11246](#) of September 24, 1965 entitled "Equal Opportunity," as amended by [Executive Order 11375](#) of October 13, 1967 and as supplemented by in Department of Labor Regulations ([41 CFR Part 60](#)). The equal opportunity clause for federally assisted construction contracts at 41 CFR Part 60-1.4 is incorporated by reference.

2. Contract Work Hours and Safety Standards Act

If the Contract is in excess of \$100,000 and involves the employment of mechanics or laborers, Contractor shall comply with [40 U.S.C. 3702](#) and [3704](#), as supplemented by Department of Labor regulations ([29 CFR Part 5](#)). Under [40 U.S.C. 3702](#) of the Act, Contractor shall be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than 1½ times the basic rate of pay for all hours worked in excess of 40 hours in the work week unless a higher rate is required by state or federal law. The requirements of [40 U.S.C. 3704](#) are applicable to construction work and provide that no laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

Contractor shall comply with the following required provisions:

- a. Overtime requirements: No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek unless a higher rate is required by state or federal law.
- b. Violation; liability for unpaid wages; liquidated damages: In the event of any violation of the clause set forth in paragraph (a) of this section the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a) of this section, in the sum of \$29 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a) of this section.
- c. Withholding for unpaid wages and liquidated damages: The State of Maine shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b) of this section.
- d. Subcontracts: The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (a) through (d) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any

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subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a) through (d) of this section.

- e. The Contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid.
- f. Records to be maintained under this provision shall be made available by the Contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the Department of Treasury, and the Department of Labor, and the Contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

3. Environmental Compliance

- a. Contracts and subgrants of amounts in excess of \$150,000 must comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act ([42 U.S.C. 7401–7671q](#)) and the Federal Water Pollution Control Act as amended ([33 U.S.C. 1251–1387](#)). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).
- b. The Contractor shall comply with all applicable standards, orders, or requirements issued under section 508 of the Clean Water Act ([33 U.S.C. 1368](#)), Executive Order 11738, Environmental Protection Agency regulations (40 CFR Part 15), and section 308 of the Federal Water Pollution Control Act ([33 U.S.C. 1318](#)), that relate generally to inspection, monitoring, entry reports, and information, and with all regulations and guidelines issued thereunder.
- c. The Contractor shall comply with all applicable standards, orders, or requirements issued under the [Resource Conservation and Recovery Act \(RCRA\)](#); [the Comprehensive Environmental Response Compensation and Liabilities Act \(CERCLA\)](#); and any applicable Federal, Codes or Local environmental regulation.

4. Protection for Whistleblowers

- a. In accordance with [41 U.S.C. § 4712](#), Contractor may not discharge, demote, or otherwise discriminate against an employee in reprisal for disclosing to any of the list of persons or entities provided below, information that the employee reasonably believes is evidence of gross mismanagement of a federal contract or grant, a gross waste of federal funds, an abuse of authority relating to a federal contract or grant, a substantial and specific danger to public health or safety, or a violation of law, rule, or regulation related to a federal contract (including the competition for or negotiation of a contract) or grant.
- b. The list of persons and entities referenced in the paragraph above includes the following:
 - i. A member of Congress or a representative of a committee of Congress;
 - ii. An Inspector General
 - iii. The Government Accountability Office;
 - iv. A Treasury employee responsible for contract or grant oversight or management;
 - v. An authorized official of the Department of Justice or other law enforcement agency;
 - vi. A court or grand jury; or

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- vii. A management official or other employee of Contractor, contractor, or subcontractor who has the responsibility to investigate, discover, or address misconduct.
- c. Contractor shall inform its employees in writing of the rights and remedies provided under this section, in the predominant native language of the workforce.

5. Domestic Preference for Procurements

Contractor should, to the greatest extent practicable under a Federal award, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subawards including all contracts and purchase orders for work or products under this award. For purposes of this section: (1) “Produced in the United States” means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States. (2) “Manufactured products” means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber ([2 CFR 200.322](#)).

6. Procurement of recovered materials

The Contractor shall comply with [section 6002 of the Solid Waste Disposal Act](#), as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at [40 CFR part 247](#) that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds \$10,000 or the value of the quantity acquired during the preceding fiscal year exceeded \$10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines ([2 CFR 200.323](#)).

7. Nondiscrimination

The Contractor shall ensure that no person is denied benefits of, or otherwise be subjected to discrimination in connection with the Contractor’s performance under this agreement, on the grounds of race, religion, color, national origin, sex, and handicap. Accordingly, and to the extent applicable, the Contractor covenants and agrees to comply with the following:

- a. [Title VI of the Civil Rights Act of 1964](#), which prohibits recipients of federal financial assistance from excluding from a program or activity, denying benefits of, or otherwise discriminating against a person on the basis of race, color, or national origin ([42 U.S.C. § 2000d et seq.](#)), as implemented by the Department of the Treasury’s Title VI regulations, [31 CFR Part 22](#), which are herein incorporated by reference and made a part of this contract (or agreement). Title VI also includes protection to persons with “Limited English Proficiency” in any program or activity receiving federal financial assistance, 42 U.S.C. § 2000d et seq., as implemented by the Department of the Treasury’s Title VI regulations, 31 CFR Part 22, and herein incorporated by reference and made a part of this contract or agreement.
- b. [The Fair Housing Act, Title VIII of the Civil Rights Act of 1968](#) (42 U.S.C. §§ 3601, et seq.), which prohibits discrimination in housing on the basis of race, color, religion, national origin, sex, familial status, or disability
- c. [Section 504 of the Rehabilitation Act of 1973](#) (29 U.S.C. § 794)
- d. [The Age Discrimination Act of 1975](#) (42 U.S.C. § 6101 et seq.) and regulations issued thereunder (45 CFR Part 90).
- e. [Title II of the Americans with Disabilities Act of 1990](#), as amended (42 U.S.C. §§ 12101 et seq.), which prohibits discrimination on the basis of disability under programs, activities, and services provided or made available by state and local governments or instrumentalities or agencies thereto.

8. Lobbying

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- a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.
- c. The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.
- d. The Interim Final Rule, New Restrictions on Lobbying, issued by the Office of Management and Budget to implement the provisions of section [319 of Public Law 101-121 \(31 U.S.C., Art 1352\)](#) is incorporated by reference.

9. Drug-Free Workplace

The Contractor will comply with the provisions of the [Drug-Free Workplace Act of 1988](#) (Public Law 100-690, title V, subtitle D; 41 U.S.C. 701 et seq.) and maintain a drug-free workplace.

10. Increasing Seat Belt Use in the United States

Pursuant to [Executive Order 13043, 62 FR 19217](#) (Apr. 18, 1997), Contractor is encouraged to adopt and enforce on-the-job seat belt policies and programs for its their employees when operating company owned, rented or personally owned vehicles.

11. Reducing Text Messaging While Driving

Pursuant to [Executive Order 13513, 74 FR 51225](#) (October 6, 2009), Contractor is encouraged to adopt and enforce policies that ban text messaging while driving, and to establish workplace safety policies to decrease accidents caused by distracted drivers.

12. Debarment and Suspension

If the Contract is in excess of \$25,000, this Contract is a covered transaction for purposes of [2 C.F.R. Part 180](#) and [2 C.F.R. Part 3000](#). As such, the Contractor is required to verify that none of the Contractor's principals (defined at [2 C.F.R. § 180.995](#)) or its affiliates (defined at [2 C.F.R. § 180.905](#)) are excluded (defined at [2 C.F.R. § 180.940](#)) or disqualified (defined at [2 C.F.R. § 180.935](#)). The Contractor must comply with 2 C.F.R. Part 180, subpart C and 2 C.F.R. Part 3000, subpart C, and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into. This certification is a material representation of fact relied upon by The State of Maine. If it is later determined that the Contractor did not comply with 2 C.F.R. Part 180, subpart C and 2 C.F.R. Part 3000, subpart C, in addition to remedies available to The State of Maine, the federal government may pursue available remedies, including but not limited to suspension and/or debarment. The bidder or proposer agrees to comply with the requirements of 2 C.F.R. Part 180, subpart C and 2 C.F.R. Part 3000, subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

13. Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment

Contractor shall use no funds provided under this Contract to:

- a. Procure or obtain;

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- b. Extend or renew a contract to procure or obtain; or
- c. Enter into a contract (or extent or renew a contract) to procure or obtain equipment, services, or systems that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. As described in Public Law 115-232, section 889, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).
 - i. For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).
 - ii. Telecommunications or video surveillance services provided by such entities or using such equipment.
 - iii. Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.
- d. The Contractor shall insert the substance of this clause, including this paragraph, into all subcontracts and other contractual instruments ([2 CFR 200.216](#)).

Data for Infrastructure Projects and Capital Expenditure Projects

14.1 Programmatic Data for Infrastructure Projects (Expenditure Category 5 (EC 5)): For all projects listed under the Water, Sewer¹, and Broadband Expenditure Categories (see Appendix 1 of the Compliance and Reporting Guidance for a listing of expenditure categories), more detailed project-level information is required. The Contractor/ Sub-recipient acknowledges that they must provide the below-referenced data associated with the services tied to this service contract/sub-award. This information will be provided to the State of Maine Contracting Department (Owner/Department) by the Contractor/Sub-recipient. Contractors and Sub-recipients are only required to provide the specific information tied to the project associated with this contract/sub-award that fits into one or more listed ECs. Each project will be required to report expenditure data as described above, but will also report the following information:

1. All Water and Sewer projects (EC 5.1-5.18):
 - Projected/actual construction start date (month/year)
 - Projected/actual initiation of operations date (month/year)
 - Public Water System (PWS) ID Number
 - National Pollutant Discharge Elimination System (NPDES) Permit Number
 - Median Household Income of Service Area²

¹ Definitions for water and sewer Expenditure Categories can be found in the EPA's handbooks. For "clean water" expenditure category definitions, please see: <https://www.epa.gov/sites/production/files/2018-03/documents/cwdefinitions.pdf>. For "drinking water" expenditure category definitions, please see: <https://www.epa.gov/dwsrf/drinking-water-staterevolving-fund-national-information-management-system-reports>.

² *For median income and lowest quintile income of Census Tracts and other geographic areas, Contractor/Sub-recipient should refer to the most recent American Community Survey 5-year estimates available through the Census website.

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- Lowest Quintile Income of the Service Area²

2. All Broadband Projects (EC 5.19-5.21):

- Projected/actual construction start date (month/year)
- Projected/actual initiation of operations date (month/year)
- Location Details
- Confirm that the project is designed to, upon completion, reliably meet or exceed symmetrical 100 Mbps download and upload speeds.
 - If the project is not designed to reliably meet or exceed symmetrical 100 Mbps download and upload speeds, explain why not, and
 - Confirm that the project is designed to, upon completion, meet or exceed 100 Mbps download speed and between at least 20 Mbps and 100 Mbps upload speed, and be scalable to a minimum of 100 Mbps download speed and 100 Mbps upload speed.
- Confirm that the service provider for the project has, or will upon completion of the project, either participated in the Federal Communications Commission (FCC)'s Affordable Connectivity Program (ACP) or otherwise provided access to a broad-based affordability program that provides benefits to households commensurate with those provided under the ACP to low-income consumers in the proposed service area of the broadband infrastructure (applicable only to projects that provide service to households).
- Detailed Project Information:
 - Project technology type(s) (Planned/Actual)
 - Fiber
 - Coaxial Cable
 - Terrestrial Fixed Wireless
 - Other (specify)
 - Total miles of fiber deployed (Planned/Actual)
 - Total number of funded locations served (Planned/Actual)
 - Pre-SLFRF Investment
 - Total Number of Funded Locations Served receiving 25/3 Mbps or below
 - Total Number of Funded Locations Served receiving between 25/3 Mbps and 100/20 Mbps
 - Post-SLFRF
 - Total Number Receiving Minimum 100/100 Mbps
 - Total Number Receiving Minimum 100/20Mbps and scalable to 100/100 Mbps
 - Total number of funded locations served, broken out by type (Planned/Actual):
 - Residential
 - Total Housing Units
 - Business
 - Community Anchor Institution
- Location-by-Location Project Information

For each location served by a Project, the Owner/Department must collect from the Contractor/Sub-recipient and submit the following information to Treasury using a predetermined file format that will be provided by Treasury (collection of certain fields will begin in October 2022, as specified below):

 - Latitude/longitude at the structure where service will be installed (required starting October 2022) Technology used to offer service at the location (required starting October 2022)
 - Location type (required starting October 2022)
 - Residential
 - If Residential, Number of Housing Units
 - Business
 - Community anchor institution
 - Speed tier at the location post-SLFRF investment (collection to be phased in)

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- Maximum download speed offered
- Maximum download speed delivered
- Maximum upload speed offered
- Maximum upload speed delivered
- Latency
- Standardized FCC Identifiers
 - Fabric ID # (Broadband Serviceable Fabric Locations)
 - FCC Issued Provider ID #

3. Wage Rate Disclosures and Certifications for Capital Expenditure and Infrastructure Projects.

A. N/A

B. To the extent that the Contractor/Sub-recipient employs laborers and mechanics as defined by the Davis Bacon Act, the Contractor/Sub-recipient must provide a project employment and local impact report detailing:

- The number of employees of contractors and sub-contractors working on the project;
- The number of employees on the project hired directly;
- The number of employees on the project hired through a third party;
- The wages and benefits of workers on the project by classification; and
- Whether those wages are at rates less than those prevailing;
- Contractor/Sub-recipient must maintain sufficient records to substantiate this information upon request.

C. To the extent that the Contractor/Sub-recipient employs laborers and mechanics as defined by the Davis Bacon Act, the Contractor/Sub-recipient must provide a project workforce continuity plan, detailing:

- How the Contractor/Sub-recipient will ensure the project has ready access to a sufficient supply of appropriately skilled and unskilled labor to ensure high-quality construction throughout the life of the project, including a description of any required professional certifications and/or in-house training;
- How the Contractor/Sub-recipient will minimize risks of labor disputes and disruptions that would jeopardize timeliness and cost-effectiveness of the project;
- How the Contractor/Sub-recipient will provide a safe and healthy workplace that avoids delays and costs associated with workplace illnesses, injuries, and fatalities, including descriptions of safety training, certification, and/or licensure requirements for all relevant workers (e.g., OSHA 10, OSHA 30);
- Whether workers on the project will receive wages and benefits that will secure an appropriately skilled workforce in the context of the local or regional labor market;

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- Whether the project has completed a project labor agreement;
- Whether the project prioritizes local hires
- Whether the project has a Community Benefit Agreement, with a description of any such agreement.

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Wage Determination Schedule

PART 1- GENERAL

1.1 Related Documents

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

1.2 Summary

- A. This Section includes the wage determination requirements for Contractors as issued by the State of Maine Department of Labor Bureau of Labor Standards or the United States Department of Labor.

1.3 Requirements

- A. Conform to the wage determination schedule for this project which is shown on the following page.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION (not used)

State of Maine Department of Labor - Bureau of Labor Standards
Augusta, Maine 04333-0045 - Telephone (207) 623-7906

Wage Determination - In accordance with 26 MRS §1301 et. seq., this is a determination by the Bureau of Labor Standards, of the fair minimum wage rate to be paid to laborers and workers employed on the below titled project.

2024 Fair Minimum Wage Rates -- Building 2 Cumberland County (other than 1 or 2 family homes)

Occupational Title	Minimum Wage	Minimum Benefit	Total
Brickmasons And Blockmasons	\$34.00	\$4.49	\$38.49
Bulldozer Operator	\$31.50	\$7.53	\$39.03
Carpenter	\$28.23	\$19.37	\$47.60
Cement Masons And Concrete Finisher	\$23.00	\$2.82	\$25.82
Commercial Divers	\$30.00	\$4.62	\$34.62
Construction And Maintenance Painters	\$31.11	\$4.74	\$35.85
Construction Laborer	\$24.33	\$2.66	\$26.99
Crane And Tower Operators	\$40.00	\$10.86	\$50.86
Crushing Grinding And Polishing Machine Operators	\$23.00	\$4.94	\$27.94
Drywall And Ceiling Tile Installers	\$28.23	\$19.37	\$47.60
Earth Drillers - Except Oil And Gas	\$22.31	\$6.19	\$28.50
Electrical Power - Line Installer And Repairers	\$38.93	\$8.91	\$47.84
Electricians	\$38.51	\$6.97	\$45.48
Elevator Installers And Repairers	\$68.38	\$45.29	\$113.67
Excavating And Loading Machine And Dragline Operators	\$26.00	\$7.18	\$33.18
Excavator Operator	\$31.38	\$5.91	\$37.29
Fence Erectors	\$26.75	\$4.05	\$30.80
Flaggers	\$20.00	\$0.38	\$20.38
Floor Layers - Except Carpet/Wood/Hard Tiles	\$27.25	\$6.59	\$33.84
Glaziers	\$33.78	\$16.35	\$50.13
Grader/Scraper Operator	\$23.00	\$1.99	\$24.99
Hazardous Materials Removal Workers	\$21.50	\$1.99	\$23.49
Heating And Air Conditioning And Refrigeration Mechanics And Installers	\$33.10	\$5.86	\$38.96
Heavy And Tractor - Trailer Truck Drivers	\$23.38	\$2.11	\$25.49
Highway Maintenance Workers	\$20.00	\$0.00	\$20.00
Industrial Machinery Mechanics	\$31.25	\$1.01	\$32.26
Industrial Truck And Tractor Operators	\$29.25	\$4.06	\$33.31
Insulation Worker - Mechanical	\$23.00	\$3.59	\$26.59
Ironworker - Ornamental	\$30.83	\$24.97	\$55.80
Light Truck Or Delivery Services Drivers	\$23.34	\$1.67	\$25.01
Millwrights	\$33.75	\$8.78	\$42.53
Mobile Heavy Equipment Mechanics - Except Engines	\$27.75	\$4.89	\$32.64
Operating Engineers And Other Equipment Operators	\$24.00	\$2.38	\$26.38
Paver Operator	\$27.03	\$6.49	\$33.52
Pile-Driver Operators	\$32.75	\$1.95	\$34.70
Pipelayers	\$28.50	\$4.89	\$33.39
Plumbers Pipe Fitters And Steamfitters	\$29.50	\$5.56	\$35.06
Pump Operators - Except Wellhead Pumps	\$31.49	\$32.08	\$63.57
Radio Cellular And Tower Equipment Installers	\$26.00	\$3.77	\$29.77
Reclaimer Operator	\$27.03	\$7.68	\$34.71
Reinforcing Iron And Rebar Workers	\$30.83	\$24.97	\$55.80
Riggers	\$29.25	\$7.79	\$37.04
Roofers	\$24.00	\$2.97	\$26.97
Screed/Wheelman	\$29.25	\$4.94	\$34.19
Sheet Metal Workers	\$25.00	\$4.71	\$29.71
Structural Iron And Steel Workers	\$30.83	\$24.97	\$55.80
Tapers	\$32.63	\$0.00	\$32.63
Telecommunications Equipment Installers And Repairers - Except Line Installers	\$28.23	\$19.37	\$47.60
Telecommunications Line Installers And Repairers	\$36.29	\$21.31	\$57.60
Tile And Marble Setters	\$27.75	\$6.73	\$34.48

Welders are classified as the trade to which welding is incidental (e.g. welding structural steel is Structural Iron and Steel Worker)


Apprentices – The minimum wage rates for registered apprentices are the rates recognized in the sponsorship agreement for registered apprentices working in the pertinent classification.

For any other specific trade on this project not listed above, contact the Bureau of Labor Standards for further clarification.

Title 26 §1310 requires that a clearly legible statement of all fair minimum wage and benefits rates to be paid the several classes of laborers, workers and mechanics employed on the construction on the public work must be kept posted in a prominent and easily accessible place at the site by each contractor and subcontractor subject to sections 1304 to 1313.

Appeal – Any person affected by the determination of these rates may appeal to the Commissioner of Labor by filing a written notice with the Commissioner stating the specific grounds of the objection within ten (10) days from the filing of these rates.

A true copy

Attest: 
Scott R. Cotnoir
Wage & Hour Director
Bureau of Labor Standards

Expiration Date: 12-31-2024
Revision Date: 3-1-2024

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work performed by Owner.
4. Owner-furnished/Contractor-installed (OFCI) products.
5. Owner-furnished/Owner-installed (OFOI) products.
6. Contractor-furnished/Owner-installed (CFOI) products.
7. Contractor's use of site and premises.
8. Coordination with occupants.
9. Work restrictions.
10. Specification and Drawing conventions.

B. Related Requirements:

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

1.2 DEFINITIONS

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

1.3 PROJECT INFORMATION

A. Project Identification: Wolfe's Neck Woods and Waters State Park.

1. Project Location: 426 Wolfe's Neck Road.

B. Owner: Department of Agriculture, Conservation and Forestry.

1. Owner's Representative: Owen Blease - owen.blease@maine.gov.

C. Architect: Kaplan Thompson Architects.

1. Architect's Representative: Phil Kaplan - phil@kaplanthompson.com.

D. Architect's Consultants: Architect has retained the following design professionals, who

have prepared designated portions of the Contract Documents:

1. Civil Engineering: Gorrill Palmer.
 - a. Site Plan Representative: Will Haskell - whaskell@gorrillpalmer.com.
 2. Electrical Engineering: Swiftcurrent
 - a. Power and Lighting plans Representative: Tim Matthews -
 3. Mechanical Engineering: Fuss & O'Neill
 - a. Mechanical Ventilation and Space conditioning, Representative: Drew Wilkinson - Drew.Wilkinson@fando.com
 4. Structural Engineering: Trillium
 - a. Representative: Tony Dumais - tonyd@trilliumeg.com
- E. Web-Based Project Software: Project software will be used for purposes of managing communication and documents during the construction stage.
1. See Section 013100 "Project Management and Coordination" for requirements for using web-based Project software.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:
1. Replacement of the entrance gatehouse additional ADA parking space and improvements to the access road and parking surfaces. Replacement of the existing Bathroom Building and a new vault toilet. and other Work indicated in the Contract Documents.
 2. Refer to Section 012300 ALTERNATES for a description of the the Base Bid and additional work that shall be performed by the contractor if approved by the owner .

1.5 WORK PERFORMED BY OWNER

- A. 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. Subsequent Work: Owner will perform the following additional work at site after Substantial Completion. Completion of that work will depend on successful completion of preparatory Work under this Contract.

1.6 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

- A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:
 - 1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
 - 2. Provide for delivery of Owner-furnished products to Project site.
 - 3. Upon delivery, inspect, with Contractor present, delivered items.
 - a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.
 - 4. Obtain manufacturer's inspections, service, and warranties for Owner Furnished Products
 - 5. Inform Contractor of earliest available delivery date for Owner-furnished products.
- B. Contractor's Responsibilities: The Work includes the following, as applicable:
 - 1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
 - 2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
 - 3. Receive, unload, handle, store, protect, and install Owner-furnished products.
 - 4. Make building services connections for Owner-furnished products.
 - 5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
 - 6. Repair or replace Owner-furnished products damaged following receipt.
- C. Owner-Furnished/Contractor-Installed (OFCI) Products:
 - 1. Iron Ranger.
 - a. Combination Bollard and collection box

1.7 OWNER-FURNISHED/OWNER-INSTALLED (OFOI) PRODUCTS

- A. The Owner will furnish and install products indicated.
- B. Owner-Furnished/Owner-Installed (OFOI) Products:
 - 1. Gatehouse.
 - a. Interior shelving
 - b. Desktop Surfaces
 - 2. Drinking Fountain
 - 3. Enclosure for New Vault Toilet

1.8 CONTRACTOR-FURNISHED/OWNER-INSTALLED (CFOI) PRODUCTS

- A. Contractor shall furnish products indicated. The Work includes unloading, handling, storing, and protecting Contractor-furnished products as directed and turning them over to Owner at Project closeout.
- B. Contractor-Furnished/Owner-Installed (CFOI) Products:
 - 1. Gatehouse.
 - a. The Contractor will purchase the sliding exterior doors, the owner will complete install.
 - b. Interior wall finished surface
 - 1) 1x6 tongue and groove, V-match pine
 - c. Interior Trim
 - 1) 1x4 Pine, flat Door and window casing
 - d. The contractor will coordinate with owner on timing of installation of all electrical outlets and light switches

1.9 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Restricted Use of Site: Each Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Limits on Use of Site: Limit use of Project site to Work in areas indicated. 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 for storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.10 COORDINATION WITH OCCUPANTS

- A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 - 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

1.11 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work to between 7:30 a.m. to 5:00 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.
 - 1. Weekend Hours: Not permitted for weekend work.
 - 2. Early Morning Hours: Town of Freeport noise Ordinance prohibits work before 6:00 am.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.
 - 1. Notify Owner not less than two days in advance of proposed disruptive operations.
 - 2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Smoking and Controlled Substance Restrictions: Use of tobacco products , alcoholic beverages, and other controlled substances on Owner's property is not permitted.

1.12 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
 - 3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
 - 4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

- A. Alternate Bid: The Contractor's written offer of a specified dollar amount, submitted on the Bid Form, for the performance of a particular scope of work described in the Bid Documents. The Owner determines the low bidder based on the sum of the base Bid and any combination of Alternate Bids that the Owner selects.

1.3 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include, as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation, whether or not indicated as part of alternate.
- B. Execute accepted alternates under the same conditions as other Work of the Contract.
- C. Schedule: A Part 3 "Schedule of Alternates" Article is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Base Bid:
 - 1. Construct a replacement entrance booth per the drawings labeled "Gatehouse" and provide new paved areas around the booth per site plans.
 - 2. Construct an accessible paved parking space with an accessible route to the gatehouse and two additional parking gravel surface spaces.
- B. Alternate No. 01:

1. Improvements to the park access road and parking and additional Bus parking spaces.
 - a. Construct 2" gravel overlay of the existing gravel roads and parking lots
 - b. Repave existing ADA parking spaces and paved sidewalks per Civil drawings
 - c. Replace the existing curb in the parking lots per the Civil drawings
 - d. Improve drainage by replacing culverts indicated on the Civil drawings
 - e. Construct three new gravel bus parking spaces per Civil drawings
- C. Alternate No. 02:
 1. Construct a replacement Bathroom Building per the drawings labeled "Bathhouse"
 - a. Six ADA single-user restrooms with baby changing tables in each
 - b. Upgrade the electrical service per the Electrical plans within the drawing set labeled "Bathhouse"
 - c. Construct new sanitary sewer service to existing septic tank
 - d. Construct new 1-inch water service from existing well to Mechanical Room in Bathhouse.
 - e. Construct a new ADA vault toilet per specification. The enclosure will be constructed by the Owner.

END OF SECTION 012300

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Bar supports.
3. Mechanical splice couplers.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of Architect.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1. Reinforcement to Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M.

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

1. Epoxy-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."

C. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement:

- a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.
2. Mechanical splice couplers.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- B. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.2 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
 - b. For epoxy-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
 - c. For dual-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
 - d. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.
 - e. For stainless steel reinforcement, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
- B. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.

2.3 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection of In-Place Conditions:
 - 1. Do not cut or puncture vapor retarder.
 - 2. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
 - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
 - 2. Do not tack weld crossing reinforcing bars.
- C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with ACI 318.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Splices: Lap splices as indicated on Drawings.
 - 1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
 - 2. Stagger splices in accordance with ACI 318.
- G. Install welded-wire reinforcement in longest practicable lengths.
 - 1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
 - a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.
 - 2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
 - 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
 - 4. Lace overlaps with wire.

3.3 JOINTS

- A. 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.
 - 2. Continue reinforcement across construction joints unless otherwise indicated.
 - 3. Do not continue reinforcement through sides of strip placements of floors and slabs.

3.4 INSTALLATION TOLERANCES

- A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
 - 1. Steel-reinforcement placement.

END OF SECTION 032000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.

1.2 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, and other pozzolans materials subject to compliance with requirements.

- B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.3 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Aggregates.
6. Admixtures:

- a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.

7. Vapor retarders.
8. Liquid floor treatments.
9. Curing materials.
10. Joint fillers.

- B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Calculated equilibrium unit weight, for lightweight concrete.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
10. Intended placement method.
11. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

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

D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

1.4 INFORMATIONAL SUBMITTALS

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

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Vapor retarders.
5. Joint-filler strips.

B. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Aggregates.

6. Admixtures:

- C. Research Reports: For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
- D. Preconstruction Test Reports: For each mix design.
- E. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
 - 1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301.

1.7 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1.
- B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

- A. Cementitious Materials:
 - 1. Portland Cement: ASTM C150/C150M, Type I/II.
 - 2. Fly Ash: ASTM C618, Class C or F.
 - 3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C33/C33M, coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Air-Entraining Admixture: ASTM C260/C260M.
- D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 2. Retarding Admixture: ASTM C494/C494M, Type B.
 3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
- E. Water and Water Used to Make Ice: ASTM C94/C94M, potable

2.3 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A; not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.4 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.

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. when dry.
- B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
1. Color:
 - a. Ambient Temperature Below 50 deg F: Black.
 - b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
 - c. Ambient Temperature Above 85 deg F: White.
- C. Curing Paper: 8-feet-wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.

- D. Water: Potable or complying with ASTM C1602/C1602M.

2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.

2.7 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, in accordance with ACI 301.
 - 1. Use a qualified 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 or Other Pozzolans: 25 percent by mass.
 - 2. Slag Cement: 50 percent by mass.
 - 3. Total of Fly Ash or Other Pozzolans, Slag Cement: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass.
 - 4. Total of Fly Ash or Other Pozzolans: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass.
- C. Admixtures: Use admixtures in accordance with 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 concrete for parking structure slabs, and concrete with a w/cm below 0.50.

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.

2.9 WATERSTOPS

- A. Flexible PVC Waterstops: U.S. Army Corps of Engineers CRD-C 572, for embeddings in concrete to prevent passage of fluids through joints, with factory fabricate corners, intersections, and directional changes.

1. Profile: Flat dumbbell with center bulb
2. Dimensions: 6 inches by 3/8 inch thick

PART 3 - EXECUTION

3.1 INSTALLATION OF 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.
 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.

3.2 INSTALLATION OF VAPOR RETARDER

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
 1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
 2. Face laps away from exposed direction of concrete pour.
 3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
 4. Lap joints 6 inches and seal with manufacturer's recommended tape.
 5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
 6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
 7. Protect vapor retarder during placement of reinforcement and concrete.
 - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

3.3 JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
 1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
 2. Place joints perpendicular to main reinforcement.

- a. Continue reinforcement across construction joints unless otherwise indicated.
 - b. Do not continue reinforcement through sides of strip placements of floors and slabs.
 3. Form keyed joints where indicated. Embed keys at least 1-1/2 inches into concrete.
 4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 6. Space vertical joints in walls as indicated on Drawings.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.
- D. Isolation Joints in Slabs-on-Ground: 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.
- E. Doweled Joints:
1. Install dowel bars and support assemblies at joints where indicated on Drawings.
 2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.
- F. Dowel Plates: Install dowel plates at joints where indicated on Drawings.

3.4 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
 - 1. If a section cannot be placed continuously, provide construction joints as indicated.
 - 2. Deposit concrete to avoid segregation.
 - 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
 - a. Do not use vibrators to transport concrete inside forms.
 - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
 - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
 - d. 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.
- F. 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. Do not place concrete floors and slabs in a checkerboard sequence.
 - 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 3. Maintain reinforcement in position on chairs during concrete placement.
 - 4. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 5. Level concrete, cut high areas, and fill low areas.
 - 6. Slope surfaces uniformly to drains where required.
 - 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.

8. Do not further disturb slab surfaces before starting finishing operations.

3.5 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
 - a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
 - b. Remove projections larger than 1 inch.
 - c. Tie holes do not require patching.
 - d. Surface Tolerance: ACI 117 Class D.
 - e. Apply to concrete surfaces not exposed to public view.
2. ACI 301 Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
 - a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
 - b. Remove projections larger than 1/4 inch.
 - c. Patch tie holes.
 - d. Surface Tolerance: ACI 117 Class B.
 - e. Locations: Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
3. ACI 301 Surface Finish SF-3.0:
 - a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
 - b. Remove projections larger than 1/8 inch.
 - c. Patch tie holes.
 - d. Surface Tolerance: ACI 117 Class A.
 - e. Locations: Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

B. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.6 FINISHING FLOORS AND SLABS

- A. Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish:
 - 1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
 - 2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch in one direction.
 - 3. Apply scratch finish to surfaces to receive concrete floor toppings to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish:
 - 1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
 - 2. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
 - 3. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish:
 - 1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
 - 2. Continue troweling passes and restraighen until surface is free of trowel marks and uniform in texture and appearance.
 - 3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 4. Do not add water to concrete surface.
 - 5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
 - 6. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - 7. 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.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.
 - 1. Coordinate required final finish with Architect before application.

2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
2. Coordinate required final finish with Architect before application.

3.7 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

- A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

- C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Prior to pouring concrete, place and secure anchorage devices.
 - a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - b. Cast anchor-bolt insert into bases.
 - c. Install anchor bolts to elevations required for proper attachment to supported equipment.

- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.

1. Cast-in inserts and accessories, as shown on Drawings.
2. Screed, tamp, and trowel finish concrete surfaces.

3.8 CONCRETE CURING

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

1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.

3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305.1, before and during finishing operations.
- B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
 2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
 3. If forms remain during curing period, moist cure after loosening forms.
 4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
 - d. Water-Retention Sheetting Materials: Cover exposed concrete surfaces with sheetting material, taping, or lapping seams.
 - e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
 - 2) Maintain continuity of coating and repair damage during curing period.
- C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
1. Begin curing immediately after finishing concrete.
 2. Interior Concrete Floors:
 - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 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.

- a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
- 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
- a) Water.
 - b) Continuous water-fog spray.
- b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
- 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
- a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
- 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.
- a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
- 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
- a) Water.
 - b) Continuous water-fog spray.
- c. Floors to Receive Polished Finish: Contractor has option of the following:
- 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
- a) Lap edges and ends of absorptive cover not less than 12 inches.

- b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
 - d. Floors to Receive Chemical Stain:
 - 1) As soon as concrete has sufficient set to permit application without marring concrete surface, install curing paper over entire area of floor.
 - 2) Install curing paper square to building lines, without wrinkles, and in a single length without end joints.
 - 3) Butt sides of curing paper tight; do not overlap sides of curing paper.
 - 4) Leave curing paper in place for duration of curing period, but not less than 28 days.
 - e. Floors to Receive Urethane Flooring:
 - 1) As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - 2) Rewet absorptive cover, and cover immediately with polyethylene moisture-retaining cover with edges lapped 6 inches and sealed in place.
 - 3) Secure polyethylene moisture-retaining cover in place to prohibit air from circulating under polyethylene moisture-retaining cover.
 - 4) Leave absorptive cover and polyethylene moisture-retaining cover in place for duration of curing period, but not less than 28 days.
 - f. Floors to Receive Curing and Sealing Compound:
 - 1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
 - 3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.9 TOLERANCES

- A. Conform to ACI 117.

3.10 APPLICATION OF LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment in accordance with manufacturer's written instructions.
 - 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
 - 2. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.
 - 3. Rinse with water; remove excess material until surface is dry.
 - 4. Apply a second coat in a similar manner if surface is rough or porous.

3.11 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
 - 1. Testing agency to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
 - 2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
 - 3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
 - a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
 - 1) Project name.
 - 2) Name of testing agency.
 - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
 - 4) Name of concrete manufacturer.
 - 5) Date and time of inspection, sampling, and field testing.
 - 6) Date and time of concrete placement.
 - 7) Location in Work of concrete represented by samples.
 - 8) Date and time sample was obtained.
 - 9) Truck and batch ticket numbers.
 - 10) Design compressive strength at 28 days.
 - 11) Concrete mixture designation, proportions, and materials.
 - 12) Field test results.
 - 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.

- 14) Type of fracture and compressive break strengths at seven days and 28 days.
- C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- D. Inspections:
1. Headed bolts and studs.
 2. Verification of use of required design mixture.
 3. Concrete placement, including conveying and depositing.
 4. Curing procedures and maintenance of curing temperature.
 5. Verification of concrete strength before removal of shores and forms from beams and slabs.
 6. Batch Plant Inspections: On a random basis, as determined by Architect.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with 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.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C143/C143M:
 - a. 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.
 - b. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete.
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C1064/C1064M:
 - a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
 5. Compression Test Specimens: ASTM C31/C31M:
 - a. Cast four (4) standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C39/C39M.
 - a. Test one lab-cured specimen at 7 days.
 - b. Test two lab-cured specimens at 28 days.
 - c. If either of the 28-day breaks are below design strength, hold the fourth specimen and test at 56 days, otherwise discard.
 - d. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. 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 if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
9. 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.
10. Additional Tests:
 - a. Testing and inspecting agency to 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.
 - b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
 - 1) Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.6.6.3.
11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.12 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.

6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. 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.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 033000

SECTION 042200 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Mortar and grout materials.
3. Reinforcement.
4. Masonry-joint reinforcement.
5. Embedded flashing materials.
6. Miscellaneous masonry accessories.
7. Masonry-cell insulation.

B. Products Installed, but Not Furnished, under This Section:

1. Precast architectural concrete trim in accordance with Section 034500 "Precast Architectural Concrete" in concrete unit masonry.
2. Glass unit masonry in accordance with Section 042300 "Glass Unit Masonry" in concrete unit masonry.
3. Steel lintels and steel shelf angles in accordance with Section 055000 "Metal Fabrications" in concrete unit masonry.

C. Related Requirements:

1. Section 051200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
2. Section 071900 "Water Repellents" for water repellents applied to surface of unit masonry assemblies.
3. Section 072119 "Foamed-in-Place Insulation" for foam insulation installed in CMU cores.
4. Section 076200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.2 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.
- C. Exposed: Weather-exposed side of a constructed wall.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data:
 - 1. For each type of product.
- B. Sustainable Design Submittals:
- C. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
 - 3. Lintel design and types required.
- D. Samples for Initial Selection:
 - 1. Architectural CMUs, in the form of small-scale units.
 - 2. Pre-faced CMUs.
 - 3. Colored mortar.
- E. Samples for Verification: For each type and color of the following:
 - 1. Architectural CMUs.
 - 2. Pre-faced CMUs.
 - 3. colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - a. Include data on material properties.
 - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 - 2. Integral water repellent used in CMUs, if not surface treated.
 - 3. Cementitious materials. Include name of manufacturer, brand name, and type.
 - 4. Mortar admixtures.
 - 5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 - 6. Grout mixes. Include description of type and proportions of ingredients.
 - 7. Reinforcing bars.

8. Joint reinforcement.
 9. Anchors, ties, and metal accessories.
- B. Mix Designs: For each type of mortar. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test in accordance with ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
 2. Include test reports, in accordance with ASTM C1019, for grout mixes required to comply with compressive strength requirement.
- C. Weather Procedures:
1. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.6 QUALITY ASSURANCE

- A. Project team craftworkers of the Masonry Contractor assigned to Project will be required to have the International Masonry Institute - Flashing Training or equal and to provide evidence of certificate or a letter of the firm's commitment to enroll key project personnel in the training program prior to the start of Project.
- B. Project team craftworkers of the Masonry Contractor assigned to Project will be required to have the International Masonry Institute - Grouting and Reinforcing Training or equal and to provide evidence of certificate or a letter of the firm's commitment to enroll key project personnel in the training program prior to the start of Project.
- C. Testing Agency Qualifications: Qualified in accordance with ASTM C1093 for testing indicated.

1.7 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Build mockups for typical exterior wall in sizes approximately **48 inches** long by **48 inches** high by full thickness, including face and backup wythes and accessories.
 - a. Include a sealant-filled joint at least **16 inches** long in exterior wall mockup.
 - b. Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately **12 inches** wide by **16 inches** high.
 - c. Include through-wall flashing installed for a **24-inch** length in corner of exterior wall mockup approximately **16 inches** down from top of mockup, with a **12-inch** length of flashing left exposed to view (omit masonry above half of flashing).

2. Protect accepted mockups from the elements with weather-resistant membrane.
3. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of **24 inches** down both sides of walls, and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 2. Protect sills, ledges, and projections from mortar droppings.
 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 402/602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is **40 deg F** and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 402/602.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- C. Source Limitations for Integral Water Repellent: Obtain integral water-repellent units from CMU and mortar manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
 - 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) in accordance with Tables 1 and 2 in TMS 402/602.
- B. Regulatory Requirements: Comply with the provisions of the following codes, specifications, and standards, except as otherwise shown or specified:
 - 1. TMS 402/602:
 - a. Maintain one copy of the standard in Project field office at all times during construction. Contractor's supervisory personnel are to be thoroughly familiar with this material as it applies to Project.

2.3 CONCRETE UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 402/602 except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
- C. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. Provide square-edged units for outside corners unless otherwise indicated.
- D. Building Lintels:
 - 1. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout.
 - a. Knockout blocks will not be acceptable.
- E. Integral Water Repellent: Surface-applied water repellent for exposed units .
 - 1. Description: Liquid polymeric, water-repellent admixture that does not reduce flexural bond strength. Units made with water repellent, when tested in accordance with ASTM E514/E514M as a wall assembly made with mortar containing water-repellent manufacturer's mortar additive, with test period extended to 24 hours, show no visible water or leaks on the back of test specimen.
 - 2. 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. ACM Chemistries
 - b. Master Builders Solutions, brand of MBCC Group, a Sika company

2.4 CONCRETE MASONRY UNITS

- A. Standard CMUs: Load-bearing ASTM C90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of **3050 psi**.
 - 2. Density Classification: See Drawings.
 - 3. Size (Width): Manufactured to dimensions **3/8 inch** less-than-nominal dimensions.
 - 4. Exposed Faces: Provide color and texture matching the range represented by

Architect's sample.

- B. Pre-Faced CMUs: Lightweight hollow concrete units complying with ASTM C90, with manufacturer's standard smooth resinous facing complying with ASTM C744.
 - 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. Echelon; an Oldcastle APG brand
 - b. The Spectra Group
 - c. York Building Products
 - 2. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of **3050 psi**.
 - 3. Size: Manufactured to dimensions specified in "Pre-Faced CMUs" Paragraph above but with pre-faced surfaces having **1/16-inch** wide returns of facing to create **1/4-inch** wide mortar joints with modular coursing.
 - 4. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.5 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
 - 1. Alkali content is not more than 0.1 percent when tested in accordance with ASTM C114.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Mortar Cement: ASTM C1329/C1329M.
 - 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. Lafarge North America Inc.
- E. Colored Cement Products: Packaged blend made from masonry cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
 - 1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 - 2. Pigments does not exceed 10 percent of portland cement by weight.
 - 3. Pigments does not exceed 5 percent of masonry cement by weight.

- F. Aggregate for Mortar: ASTM C144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than **1/4 inch** thick, use aggregate graded with 100 percent passing the **No. 16** sieve.
 - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- G. Aggregate for Grout: ASTM C404.
- H. Epoxy Pointing Mortar: ASTM C395, epoxy-resin-based material formulated for use as pointing mortar for glazed or pre-faced masonry units (and approved for such use by manufacturer of units); in color indicated or, if not otherwise indicated, as selected by Architect from manufacturer's colors.
- I. Water: Potable.

2.6 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, **Grade 60**.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from **0.148-inch** steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
 - 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. Heckmann Building Products, Inc.
 - b. Hohmann & Barnard, Inc
 - c. Wire-Bond
- C. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A951/A951M.
 - 1. Interior Walls: Hot-dip galvanized carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized carbon steel.
 - 3. Wire Size for Side Rods: **0.187-inch** diameter.
 - 4. Wire Size for Cross Rods: **0.187-inch** diameter.
 - 5. Spacing of Cross Rods: Not more than **16 inches** o.c.
 - 6. Provide in lengths of not less than **10 ft.**, with prefabricated corner and tee units.

2.7 TIES AND ANCHORS

- A. General: Ties and anchors extend at least **1-1/2 inches** into masonry but with at least a **5/8-inch** cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A82/A82M, with ASTM A153/A153M, Class B-2 coating.
 - 2. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
- D. Partition Top Anchors: **0.105-inch-** thick metal plate with a **3/8-inch-** diameter metal rod **6 inches** long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- E. Rigid Anchors: Fabricate from steel bars bent to configuration indicated.
 - 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A153/A153M.

2.8 EMBEDDED FLASHING MATERIALS

- A. Embedded Flashing Applications: Unless otherwise indicated, use the following:
 - 1. Where flashing is indicated to receive counterflashing, use metal flashing.
 - 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
 - 3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge.
 - 4. Where flashing is fully concealed, use flexible flashing.
- B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as

indicated.

- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

2.10 MASONRY-CELL INSULATION

- A. Masonry-Cell Fill: Lightweight-aggregate fill, ASTM C331/C331M.
- B. Molded-Polystyrene Insulation Units: CMU units with molded rigid expandable polystyrene-inserts to comply with ASTM C578, Type 1. Provide insulated block units designed for installing in cores of masonry units.

2.11 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use masonry cement mortar unless otherwise indicated.
 - 3. For exterior masonry, use masonry cement mortar.
 - 4. For reinforced masonry, use masonry cement mortar.
 - 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 - 1. For masonry below grade or in contact with earth, use Type S.
 - 2. For reinforced masonry, use Type S.
 - 3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
 - 4. For interior non-load-bearing partitions, Type O may be used instead of Type N.
- C. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
 - 1. Pigments does not exceed 10 percent of portland cement by weight.
 - 2. Pigments does not exceed 5 percent of masonry cement by weight.
 - 3. Mix to match Architect's sample.
 - 4. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Architectural CMUs.

- b. Pre-faced CMUs.
 - c. Acoustical CMUs.
- D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
 - 1. Mix to match Architect's sample.
 - 2. Application: Use colored-aggregate mortar for exposed mortar joints with the following units:
 - a. Architectural CMUs.
 - b. Pre-faced CMUs.
 - c. Acoustical CMUs.
- E. Grout for Unit Masonry: Comply with ASTM C476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 402/602 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C476, Table 1.
 - 3. Provide grout with a slump of **8 to 11 inches** as measured in accordance with ASTM C143/C143M.
- F. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.
 - 1. Application: Use epoxy pointing mortar for exposed mortar joints with pre-faced CMUs.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
 - 4. Verify that substrates are free of substances that would impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- D. Exposed Masonry: Mix units to produce uniform blend of colors and textures.
- E. Where existing masonry occurs, match coursing, bonding, color, and texture of existing masonry.
- F. Temperature Control: Perform temperature-sensitive construction procedures while masonry Work is progressing. Temperature ranges indicated below apply to air temperatures existing at time of installation except for grout. For grout, temperature ranges apply to anticipated minimum night temperatures. In heating mortar and grout materials, maintain mixing temperature selected within **10 deg F**.
 - 1. 40 to 32 Deg F (4 to 0 Deg C):
 - a. Mortar: Heat mixing water to produce mortar temperature between **40 and 120 deg F**.
 - b. Grout: Follow normal masonry procedures.
 - 2. 32 to 25 Deg F (0 to Minus 4 Deg C):
 - a. Mortar: Heat mixing water and sand to produce mortar temperatures between **40 and 120 deg F**; maintain temperature of mortar on boards above freezing.
 - b. Grout: Heat grout materials to **90 deg F** to produce in-place grout temperature of **70 deg F** at end of workday.
 - 3. 25 to 20 Deg F (Minus 4 to 7 Deg C):
 - a. Mortar: Heat mixing water and sand to produce mortar temperatures between **40 and 120 deg F**; maintain temperature of mortar on boards above freezing.
 - b. Grout: Heat grout materials to **90 deg F** to produce in-place grout temperature of **70 deg F** at end of workday.
 - c. Heat both sides of walls under construction using salamanders or other heat sources.
 - d. Use windbreaks or enclosures when wind is in excess of 15 mph.
 - 4. 20 Deg F (Minus 7 Deg C) and Below:

- a. Mortar: Heat mixing water and sand to produce mortar temperatures between **40 and 120 deg F**.
 - b. Grout: Heat grout materials to **90 deg F** to produce in-place grout temperature of **70 deg F** at end of workday.
 - c. Masonry Units: Heat masonry units so that they are above **20 deg F** at time of laying.
 - d. Provide enclosure and auxiliary heat to maintain an air temperature of at least **40 deg F** for 24 hours after laying units.
5. Do not heat water for mortar and grout to above **160 deg F**.
- G. Masonry Protection: Protect completed masonry and masonry not being worked on in the following manner. Temperature ranges indicated apply to mean daily air temperatures except for grouted masonry. For grouted masonry, temperature ranges apply to anticipated minimum night temperatures.
1. 40 to 32 Deg F (4 to 0 Deg C): Protect masonry from rain or snow for at least 24 hours by covering with weather-resistive membrane.
 2. 32 to 25 Deg F (0 to Minus 4 Deg C): Completely cover masonry with weather-resistive membrane for at least 24 hours.
 3. 25 to 20 Deg F (Minus 4 to 7 Deg C): Completely cover masonry with weather-resistive insulating blankets or similar protection for at least 24 hours, 48 hours for grouted masonry.
 4. 20 Deg F (Minus 7 Deg C) and Below: Except as otherwise indicated, maintain masonry temperature above 32 deg F (0 deg C) for 24 hours using enclosures and supplementary heat, electric heating blankets, infrared lamps or other methods proven to be satisfactory. For grouted masonry, maintain heated enclosure to **40 deg F** for 48 hours.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus **1/2 inch** or minus **1/4 inch**.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus **1/2 inch**.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus **1/4 inch** in a story height or **1/2 inch** total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than **1/4 inch in 10 ft.**, or **1/2 inch** maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than **1/8 inch in 10 ft.**, **1/4 inch in 20 ft.**, or **1/2 inch** maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than **1/4 inch in 10 ft.**, **3/8 inch in 20 ft.**, or **1/2 inch** maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals,

and expansion and control joints, do not vary from plumb by more than **1/8 inch in 10 ft.**, **1/4 inch in 20 ft.**, or **1/2 inch** maximum.

5. For lines and surfaces, do not vary from straight by more than **1/4 inch in 10 ft.**, **3/8 inch in 20 ft.**, or **1/2 inch** maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than **1/4 inch in 10 ft.** or **1/2 inch** maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than **1/16 inch**.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus **1/8 inch**, with a maximum thickness limited to **1/2 inch**.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than **1/8 inch**.
3. For head and collar joints, do not vary from thickness indicated by more than plus **3/8 inch** or minus **1/4 inch**.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus **1/8 inch**.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal **4-inch** horizontal face dimensions at corners or jambs.
- C. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- G. Fill cores in hollow CMUs with grout **24 inches** under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- H. Build non-load-bearing interior partitions full height of story to underside of solid floor or

roof structure above unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide **1/2-inch** clearance between end of anchor rod and end of tube. Space anchors **48 inches** o.c. unless otherwise indicated.
3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."
5. Joint Sealants: Comply with ASTM C1193 for use of joint sealants, including acoustic sealants as applicable to materials, applications and Project conditions.
6. Penetration Firestopping: Install penetration firestopping systems for Project applications to comply with manufacturer's written installation instructions.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Where applicable, set masonry trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.

1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
2. Wet joint surfaces thoroughly before applying mortar.
3. Rake out mortar joints for pointing with sealant.

D. Rake out mortar joints at pre-faced CMUs to a uniform depth of **1/4 inch** and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.

E. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

F. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

G. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.

3.6 MASONRY-CELL FILL INSTALLATION

- A. Pour insulation materials into cavities to fill void spaces. Maintain inspection ports to show presence of fill at extremities of each pour area. Close the ports after filling has been confirmed. Limit the fall of fill to one story high, but not more than **20 ft.**
- B. Install molded-polystyrene insulation units into masonry unit cells before laying units.

3.7 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of **5/8 inch** on exterior side of walls, **1/2 inch** elsewhere. Lap reinforcement a minimum of **6 inches**.
 - 1. Space reinforcement not more than **16 inches** o.c.
 - 2. Space reinforcement not more than **8 inches** o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than **8 inches** above and below wall openings and extending **12 inches** beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.8 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
 - 1. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 2. Space anchors as indicated, but not more than **24 inches** o.c. vertically and **36 inches** o.c. horizontally.

3.9 CONTROL JOINTS

- A. General: Install control joint materials in CMUs as masonry progresses. Do not allow materials to span control joints without provision to allow for in-plane wall or partition movement.
- B. Locate control joints. See Drawings.

C. Form control joints in CMUs as follows:

1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install preformed control joint gaskets designed to fit standard sash block.

3.10 LINTELS

A. Install lintels over openings as indicated.

B. Provide concrete or formed-in-place masonry lintels where shown and where openings of more than **12 inches** for brick-size units and **24 inches** for block-size units are shown without structural steel or other supporting lintels. Provide minimum bearing of **8 inches** at each jamb unless otherwise indicated.

C. Install loose steel over openings See Drawings.

1. Provide minimum bearing of **8 inches** at each jamb unless otherwise indicated.

3.11 FLASHING

A. General: Install embedded flashing at ledges and other obstructions to downward flow of water in wall where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At lintels, extend flashing a minimum of **6 inches** into masonry at each end. At heads and sills, extend flashing **6 inches** at ends and turn up not less than **2 inches** to form end dams.
3. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than **1-1/2 inches** or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.

C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.

3.12 REINFORCED UNIT MASONRY

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 402/602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Limit height of vertical grout pours to not more than **60 inches**.

3.13 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as Work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid-strippable masking agent or polyethylene film and waterproof masking tape.

3.14 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are

Contractor's property. At completion of unit masonry work, remove from Project site.

- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - 1. Crush masonry waste to less than **4 inches** in each dimension.
 - 2. Mix masonry waste with at least 2 parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."
 - 3. Do not dispose of masonry waste as fill within **18 inches** of finished grade.
- C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042200

SECTION 042300 - GLASS UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass block.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for loose steel lintels at glass unit masonry assemblies.

1.2 SEQUENCING AND SCHEDULING

- A. Sequence and coordinate completion of glass unit masonry assemblies so sealants can be installed immediately after mortar has attained final set.

1.3 ACTION SUBMITTALS

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

- B. Shop Drawings: Fabrication and installation details for glass unit masonry, including vertical and horizontal coursing, anchors, reinforcement, and expansion strips. Include accessories where indicated.

- C. Samples for Initial Selection: Manufacturer's actual glass-block units.

- D. Samples for Verification:

1. Glass-block units.
2. Panels consisting of four full-size glass-block units with glass-block grid joints.

1.4 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup of typical exterior panel, **48 by 48 inches** in size.
2. Build mockup of typical exterior wall area containing glass unit masonry assembly as shown on Drawings.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves

- such deviations by Change Order.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store glass block in unopened cartons on elevated platforms, under cover, and in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.
- B. Store glass-block grid materials in unopened cartons in an enclosed, dry location.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- E. Store accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with installation of glass unit masonry assemblies only when ambient and material temperatures are **40 deg F** or higher.
 1. Maintain temperature in installation areas at **40 deg F** or above for 48 hours after installing.
 2. Do not install sealants when ambient and substrate temperatures are outside limits permitted by sealant manufacturer or when joint substrates are wet.

PART 2 - PRODUCTS

2.1 GLASS BLOCK

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 1. Seves Glass Block, Inc.
- B. Glass Unit Masonry: Drawing 1 on sheet A-5.1.
 1. Sizes, General: Provide manufacturer's standard sizes unless indicated as custom.
 2. Square Glass-Block Size: **7-3/4 inches** square by 4 inches thick.
 3. Glass Color: Colorless.
 4. Edge-Coating Color: White.

- a. Provide one color throughout for each pattern indicated.
- 5. Special Shapes and Finishing Units: Drawing 1 on sheet A-5.1.
- 6. Glass Blocks for Crafting: Drawing 1 on sheet A-5.1.
 - a. Glass-Block Size: 8x8x4.
 - b. Glass-Block Shape: Square.
 - c. Glass-Block Color: Clear/white.
 - d. Glass-Block Pattern: NUBIO.
 - e. Glass-Block Joint Size and Type: 3/8 inch.

2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or Type II. Provide natural color or white cement as required to produce mortar color indicated.
 - 1. Where joints are indicated to be raked out and pointed, gray cement may be used for setting mortar.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Colored Cement Product: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
 - 1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 - 2. Pigments do not exceed 10 percent of portland cement by weight.
- E. Aggregate: ASTM C144, with 100 percent passing **No. 8** sieve.
 - 1. For pointing mortar, use aggregate graded with 100 percent passing **No. 16** sieve.
 - 2. White Aggregates: Natural white sand or crushed white stone.
 - 3. Colored Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- F. Water: Potable.

2.3 GLASS UNIT MASONRY ACCESSORIES

- A. Fasteners, General: Unless otherwise indicated, provide Type 304 or Type 316 stainless steel fasteners at exterior walls and zinc-plated fasteners with coating complying with ASTM B633, Class Fe/Zn 5, at interior walls. Select fasteners for type, grade, and class required.

- B. Plastic-Foam Expansion Strips: Polyethylene foam complying with requirements of glass-block manufacturer; **3/8 inch** thick by **3-1/2 inches** wide.
- C. Sealants: Manufacturer's standard elastomeric sealants of base polymer and characteristics indicated below that comply with applicable requirements in Section 079200 "Joint Sealants."
 - 1. Silicone: Nonstaining, S, NS, 50, NT Sikaflex 1A, Sheet A-5.1.
 - 2. Sealant shall have a VOC content of 250 g/L or less.
 - 3. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 - 5. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.
- D. Sealant Accessories: Provide sealant accessories, including primers, bond-breaker tape, and cylindrical sealant backing, that comply with applicable requirements in Section 079200 "Joint Sealants."

2.4 MORTAR MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, or antifreeze compounds unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar.
 - 2. For mortar in exterior panels, use water-repellent admixture in accordance with admixture manufacturer's written instructions.
 - 3. Limit cementitious materials in mortar to portland cement and lime.
- B. Mortar for Glass Unit Masonry Assemblies:
 - 1. Comply with ASTM C270, Proportion Specification for Type S mortar.
 - a. Combine and thoroughly mix cementitious materials, water, and aggregates in a mechanical batch mixer unless otherwise indicated. Mix mortar to produce a stiff but workable consistency that is drier than mortar for brick or concrete masonry. Discard mortar when it has reached initial set.
- C. Pigmented Mortar: Use colored cement product.

1. Pigments do not exceed 10 percent of portland cement by weight.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine sills, jambs, and heads surrounding glass unit masonry assemblies, 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 INSTALLATION OF GLASS BLOCK WITH MORTAR

- A. General: Install masonry units in accordance with manufacturer's written instructions.
 1. Where applicable, fasten frames and anchors or clips securely to surrounding construction.
 2. Shim starting track as needed to make it level.
 3. Arrange coursing pattern to provide consistent joint work throughout.
- B. Set glass block with completely filled bed and head joints, with no furrowing, accurately spaced and coordinated with other construction. Maintain **3/8-inch** exposed joint widths unless otherwise indicated.
- C. Use rubber mallet to tap units into position. Do not use steel tools, and do not allow units to come into contact with metal accessories and frames.
- D. Use plastic spacers in mortar joints to produce uniform joint widths and to prevent mortar from being squeezed out of joints.
- E. Keep expansion joints free of mortar.
- F. Point joints by filling with sealant to comply with requirements in Section 079200 "Joint Sealants."
- G. Clean glass unit masonry assemblies as work progresses. Remove mortar fins and smears immediately, using a clean, wet sponge or a scrub brush with stiff fiber bristles. Do not use harsh cleaners, acids, abrasives, steel wool, or wire brushes when removing mortar or cleaning glass unit masonry assemblies.
- H. Install sealant at jambs, heads, mullions, and other locations indicated. Prepare joints, including installation of primer and bond-breaker tape or cylindrical sealant backing, and apply elastomeric sealants to comply with requirements in Section 079200 "Joint Sealants."
- I. Construction Tolerances: Set glass block to comply with the following tolerances:

1. Variation from Plumb: For vertical lines and surfaces, do not exceed **1/8 inch in 10 ft.**, **1/4 inch in 20 ft.**, or **3/8 inch in 40 ft.** or more.
2. Variation in Mortar-Joint Thickness: Do not vary from joint thickness indicated by more than plus or minus **1/16 inch.**
3. For faces of adjacent exposed units, do not vary from flush alignment by more than **1/16 inch.**

3.3 INSTALLATION OF GLASS BLOCK WITH SEALANT

- A. General: Install mortarless glass-block systems in accordance with manufacturer's written instructions.
 1. Fasten frames and anchors or clips securely to surrounding construction.
 2. Shim starting track as needed to make it level.
 3. Adhere glass block to starting track and spacers with silicone sealant.
- B. After glass blocks are installed, apply sealant to completely fill channel around each glass block, and tool flush with exterior surface. Remove excess sealant and smears.

3.4 CLEANING

- A. On surfaces adjacent to glass unit masonry assemblies, remove mortar, sealants, and other residue resulting from glass-block installation, in a manner approved by manufacturers of materials involved.
- B. Remove excess sealants with commercial solvents in accordance with sealant manufacturer's written instructions. Exercise care not to damage sealant in joints.
- C. Perform final cleaning of glass unit masonry assemblies when surface is not exposed to direct sunlight. Start at top of panel using generous amounts of clean water. Remove water with clean, dry, soft cloths; change cloths frequently to eliminate dried mortar particles and aggregate.

END OF SECTION 042300

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.
2. Shrinkage-resistant grout.

1.2 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Anchor rods.
4. Threaded rods.
5. Galvanized-steel primer.
6. Shrinkage-resistant grout.

- B. Shop Drawings: Show fabrication of structural-steel components.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303.
2. ANSI/AISC 360.
3. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

- B. Connection Design Information:

1. Option 1: Connection designs have been completed and connections indicated on the Drawings.

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A992/A992M.
- B. Channels, Angles: ASTM A36/A36M.
- C. Plate and Bar: ASTM A36/A36M.
- D. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade B structural tubing.
- E. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.
- F. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

- A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
 - 1. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with plain finish.
- B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, heavy-hex head assemblies, consisting of steel structural bolts with splined ends; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
 - 1. Finish: Plain.

2.4 RODS

- A. Headed Anchor Rods: ASTM F1554, Grade 36, straight.
 - 1. Finish: Plain.
- B. Threaded Rods: ASTM A36/A36M.
 - 1. Finish: Plain.

2.5 SHRINKAGE-RESISTANT GROUT

- A. Metallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

2.7 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

2.8 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.
 - 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

2.9 SHOP PRIMING

- A. Shop prime steel surfaces, except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2. Surfaces to be field welded.
 - 3. Surfaces of high-strength bolted, slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 5. Galvanized surfaces unless indicated to be painted.
 - 6. Surfaces enclosed in interior construction.
- B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:

EXECUTION

2.10 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

2.11 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.
- B. Baseplates Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. Snug-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.
 - 4. Promptly pack shrinkage-resistant 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 grouting.
- C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

2.12 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.
 - 1. Joint Type: Slip critical.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 1) Radiographic Inspection: ASTM E94/E94M.

END OF SECTION 051200

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Wood blocking and nailers.
4. Wood furring.
5. Wood sleepers.
6. Plywood backing panels.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of process and factory-fabricated product.
2. For preservative-treated wood products.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates:

1. 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.
2. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Engineered wood products.
4. Shear panels.
5. Power-driven fasteners.
6. Post-installed anchors.
7. Metal framing anchors.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber 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. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content:
 - 1. Boards: 19 percent.
 - 2. Dimension Lumber: 19 percent unless otherwise indicated.
 - 3. Timber: 19 percent.
- C. 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, as published by manufacturer, are to meet or exceed those indicated. Manufacturer's published values are to be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 PRESERVATIVE TREATMENT

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.

3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATMENT

- A. General: Where fire-retardant-treated materials are indicated, materials are to comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 1. Exterior Type: Treated materials are to comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
 2. Interior Type A: Treated materials are to have a moisture content of 28 percent or less when tested according to ASTM D3201/D3201M at 92 percent relative humidity. Use where exterior type is not indicated.
- C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. Application: Treat items indicated on Drawings.

2.4 DIMENSION LUMBER FRAMING

- A. Non-Load-Bearing Interior Partitions by Grade: Construction, Stud, or No. 3 grade.
 1. Application: Interior partitions not indicated as load bearing.
- B. Framing Other Than Non-Load-Bearing Partitions by Grade: No. 2 grade.
 1. Application: Framing other than interior partitions not indicated as load bearing.

2.5 ENGINEERED WOOD PRODUCTS

- A. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D5456 and manufactured with an exterior-type adhesive complying with ASTM D2559.
 - 1. Extreme Fiber Stress in Bending, Edgewise: 2800 psi for 12-inch nominal-depth members.
 - 2. Modulus of Elasticity, Edgewise: 2,000,000 psi.
- B. 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. Comply with material requirements of and with structural capacities established and monitored according to ASTM D5055.
 - 1. Web Material: Either OSB or plywood, complying with DOC PS 1 or DOC PS 2, Exposure 1.
 - 2. Structural Properties: Depths and design values not less than those indicated.
- C. Rim Boards: Product designed to be used as a load-bearing member and to brace wood I-joists at bearing ends, complying with research or evaluation report for I-joists.
 - 1. Manufacturer: Provide products by same manufacturer as I-joists.
 - 2. Material: All-veneer product, glued-laminated wood or product made from any combination solid lumber, wood strands, and veneers.
 - 3. Thickness: 1-1/4 inches, minimum

2.6 MISCELLANEOUS LUMBER

- A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Rooftop equipment bases and support curbs.
 - 4. Cants.
 - 5. Furring.
 - 6. Grounds.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.
- C. Concealed Boards: 19 percent maximum moisture content.

2.7 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exposure 1, C-D Plugged, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.8 FASTENERS

- A. General: Fasteners are to be of size and type indicated and comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
- B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- C. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction.

2.9 METAL FRAMING ANCHORS

- A. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 coating designation.
 - 1. Use for interior locations unless otherwise indicated.
- B. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A653/A653M; 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 coating designation; and not less than 0.036 inch thick.
 - 1. Use for wood-preservative-treated lumber and where indicated.

2.10 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets:
 - 1. Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

- C. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- D. Install shear wall panels to comply with manufacturer's written instructions.
- E. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- F. Do not splice structural members between supports unless otherwise indicated.
- G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

END OF SECTION 061000

SECTION 061600.16 - SHEATHING (ZIP 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:
 - 1. Combination wall sheathing, water resistive barrier and air barrier.
 - 2. Combination roof sheathing and roof underlayment.
 - 3. Self-adhering flexible flashing.
 - 4. Liquid-applied flashing membrane.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for plywood backing panels.
 - 2. Section 072500 "Weather Barriers" for water-resistive barrier applied over wall sheathing.
 - 3. Section 072700 "Air Barriers".

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. For panels with integral water resistive barrier, include data on air/-moisture-infiltration protection based on testing according to referencing standards.
- B. Sustainable Design Submittals:
 - 1. Inputs for EA Prerequisite 2 and Credit EA 1: Proposed design input for exterior wall construction with air barrier performance taken into consideration.
 - 2. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
 - 3. Certificates for Credit MR 5.1 or 5.2: Certificates verifying that materials were extracted, processed, and manufactured within **500 miles** of the project site.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Capable of demonstrating that all wood procurement operations are conducted in accordance with procedures and policies of the Sustainable Forestry Initiative (SFI) Program.
- B. Code Compliance: Comply with requirements of the following:
 - 1. International Code Council (ICC), ICC-ESR1473.
 - 2. International Code Council (ICC), ICC-ESR1474.
 - 3. International Code Council (ICC), ICC-ESR2227.
 - 4. International Association of Plumbing and Mechanical Officials (IAPMO); IAPMO-ER365.
 - 5. State of Florida, Florida Product Approval FL 5930.
 - 6. State of Florida, Florida Product Approval FL 6565.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Outdoor Storage. Comply with manufacturer's recommendations and as follows:
 - 1. Set panel bundles on supports to keep off ground.
 - 2. Cover panels loosely with waterproof protective material.
 - 3. Anchor covers on top of stack, but keep away from sides and bottom to assure adequate air circulation.
 - 4. When high moisture conditions exist, cut banding on panel stack to prevent edge damage.

1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sheathing system that fail due to manufacturing defects within specified warranty period.
 - 1. Construction Period Warranty: Manufacturer shall warrant the panels and tape for weather exposure for a period of 180 days from installation.
 - 2. System Warranty Period: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WOOD PANEL PRODUCTS

- A. Oriented Board: DOC PS 2-10.
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated. Thickness shall satisfy minimum and maximum requirements for referenced performance category.
- C. Factory mark panels to indicate compliance with applicable standard.

2.3 COMBINATION WALL SHEATHING, AIR AND WATER-RESISTIVE BARRIER

- A. Oriented-Strand-Board Wall Sheathing: With integral water-resistive barrier, Exposure 1 sheathing.
 - 1. Span Rating, Panel Grade and Performance Category: Not less than 24/16; **Rated Sheathing 7/16 Performance Category** .
 - 2. Edge Profile: Square edge .
 - 3. Provide fastening guide on top panel surface with pre-spaced fastening symbols for **16-inches** and **24-inches** on centers spacing.
 - 4. Performance Standard: DOC PS2-10 and ICC-ES ESR-1474.
 - 5. Factory laminated integral water-resistive barrier facer.
 - 6. Perm Rating of Integral Water-Resistive Barrier: 12-16 perms.
 - 7. Assembly maximum air leakage of **0.0072 cfm/sq. ft.** infiltration and **0.0023 cfm/sq. ft.** exfiltration at a pressure differential of **1.57**.
 - 8. Exposure Time: Designed to resist weather exposure for 180 days.

2.4 COMBINATION ROOF SHEATHING AND ROOF UNDERLAYMENT

- A. Oriented-Strand-Board Roof Sheathing: With integral water-resistive barrier, Exposure 1, Structural I sheathing.
 - 1. Span Rating, Panel Grade and Performance Category: Not less than 40/20; Structural 1; 5/8 Performance Category.
 - 2. Edge Profile: Square edge .
 - 3. Provide fastening guide on top panel surface with pre-spaced fastening symbols for **16-inches** and **24-inches** on center spacing.
 - 4. Performance Standard: DOC PS2-10 and ICC-ES ESR-1473.
 - 5. Factory laminated integral roofing underlayment facer.
 - 6. Exposure Time: Designed to resist weather exposure for 180 days.
- B. Panel Edge Clips: Provide panel edge clips approved for application in accordance with code approvals and panel manufacturer's written instructions.

2.5 FASTENERS

- A. General: Provide fasteners of size and type that comply with requirements specified in this article by the authority having jurisdiction, International Building Code, International

Residential Code, Wood Frame Construction manual, and National Design Specification.

2.6 MISCELLANEOUS MATERIALS

- A. Self-Adhering Seam and Flashing Tape: Pressure-sensitive, self-adhering, cold-applied, proprietary seam tape consisting of polyolefin film with acrylic adhesive.
 - 1. Thickness: **0.012 inch**
 - 2. Width: **3.75 inch** (95.3 mm) **6 inch**
 - 3. Code Compliance: Comply with requirements of authorities having jurisdiction and ICC Evaluation Service, Inc. "AC148 - Acceptance Criteria for Flexible Flashing Materials."
 - 4. International Code Council (ICC), ICC-ES ESR2227.
 - 5. American Architectural Manufacturer's Association; AAMA 711.
- B. Liquid-Applied Flashing Membrane: Gun-grade, cold-applied, silyl-terminated polyether (STPE) liquid flashing membrane compatible with sheathing/weather barrier and self-adhering seam and flashing tape, and tested as part of an assembly meeting performance requirements. Follow manufacturer's recommendation for integration with self-adhering seam and flashing tape.
 - 1. Hardness, Shore A, ASTM C 661: 40 to 45.
 - 2. Total Solids: 99 percent.
 - 3. Tensile Strength, ASTM D 412: **75 psi**.

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.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 - 1. Chapter 23 in the ICC's Code.
 - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
 - 3. ICC-ES evaluation report for fastener.
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

- E. Coordinate wall parapet and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Only mechanically attached and drainable EIFS and exterior insulation should be used with ZIP System wall sheathing.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall and Roof Sheathing:
 - a. Nail or staple to wood framing.
 - b. Screw to cold-formed metal framing.
 - c. Space panels **1/8 inch** apart at edges and ends.
 - d. Install fasteners **3/8 inch** to **1/2 inch** from panel edges.
 - e. Space fasteners in compliance with requirements of authority having jurisdiction.

3.3 SHEATHING JOINT TREATMENT

- A. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply seam tape to joints between sheathing panels.
 - 2. Utilize tape gun or hard rubber roller provided by manufacturer to ensure tape is completely adhered to substrates.
 - 3. When using liquid-applied flashing to seal sheathing joints follow manufacturer's recommendations for sealing panel seams.

3.4 FLEXIBLE OR LIQUID-APPLIED FLASHING INSTALLATION

- A. Apply tape flexible flashing or membrane where indicated to comply with manufacturer's written instructions.
 - 1. After flexible flashing tape has been applied, roll surfaces with a hard rubber to ensure that flashing is completely adhered to substrates.
 - 2. Width for flexible flashing: **6 inch**.
 - 3. Apply liquid-applied flashing membrane at penetrations, gaps, and cracks to form continuous weathertight surface. Apply liquid membrane according to manufacturer's written instructions. Follow manufacturer's recommendation for

integration with seam and flashing tape.

- B. Apply liquid applied flashing membrane where indicated to comply with manufacturer's written instructions.
 - 1. After liquid applied flashing membrane has been applied, tool wet product with a plastic spreader, putty knife, or similar tool to ensure that flashing is opaque and substrate is no longer visible.
 - 2. Minimum Thickness for Liquid Flashing: **12 mils**.
 - 3. Apply liquid flashing membrane according to manufacturer's written instructions. Follow manufacturer's recommendations for integration with seam and flashing tape or flexible flashing tape.
- C. Apply flexible flashing tape where indicated to comply with manufacturer's written instructions.
 - 1. After flexible flashing tape has been applied, roll surfaces with a hard rubber to ensure that flashing is completely adhered to substrates.
 - 2. Width of flexible flashing: **6 inches** or **10 inches**.

END OF SECTION 061600.16

SECTION 066500 - PLASTIC TRIM EXTERIOR SYNTHETIC TRIM BORAL

PART 1 - GENERAL

1.1 CONDITIONS AND REQUIREMENTS

- A. The General Conditions, Supplementary Conditions, and Division 01 – General Requirements apply.

1.2 SUMMARY

1.3 Section Includes:

- A. Exterior synthetic (poly-ash) trim.

1.4 RELATED SECTIONS

- A. Section 09 91 00 – Painting: Painting exterior synthetic trim.

1.5 REFERENCES

- A. Reference Standards
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C1185: Standard Test Methods for Sampling and Testing Non-Asbestos Fiber-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards.
 - 2. ASTM D570: Standard Test Method for Water Absorption of Plastics.
 - 3. ASTM D1761: Standard Test Methods for Mechanical Fasteners in Wood and Wood-Based Materials.
 - 4. ASTM D6341: Standard Test Methods for Determination of the Linear Coefficient of Thermal Expansion of Plastic Lumber and Plastic Shapes between -30 and 140°F.
 - 5. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.
- 6. American Wood Protection Association (AWPA):
 - 7. AWPA E1: Laboratory Methods for Evaluating the Termite Resistance of Wood-Based Materials: Choice and No-Choice Tests.
 - 8. AWPA E10: Laboratory Method for Evaluating the Decay Resistance of Wood-Based Materials Against Pure Basidiomycete Cultures: Soil/Block Test.

1.6 SUBMITTALS

- A. Comply with Section 01 33 00 – Submittal Procedures.

- B. Product Data:
 - 1. Submit manufacturer's printed product literature, specifications, and data sheet.
- C. Manufacturer's Samples: Submit manufacturer's sample of exterior synthetic trim, minimum 1 inch by 4 inches by 8 inches long (25.4 millimeters by 101.6 millimeters by 203.2 millimeters).
- D. Certificates: Submit manufacturer's certification that materials comply with specified requirements and are suitable for the intended application.
- E. Warranty Documentation: Submit manufacturer's standard warranty.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Storage and Handling Requirements:
- B. Store and handle materials in accordance with manufacturer's instructions.
- C. Keep materials in protective covering until installation.
- D. Store exterior synthetic trim in a clean, dry area. Exterior synthetic trim must be stored on a flat, level surface and be kept free of dirt and debris.
- E. Protect materials and finish during storage, handling, and installation to prevent damage.

1.8 WARRANTY

- A. Warranty Period for Exterior Synthetic Trim: 20-year limited warranty.
- B. No decay due to rot.
- C. No excel swelling from moisture.
- D. Resists termite damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Specified Manufacturer: Westlake Royal Building Products, TruExterior® Siding & Trim Brand, 29797 Beck Rd, Wixom, MI 48393; 800-521-8486. Email: bianca.warner@westlake.net; Web: www.truexterior.com.
- B. Substitutions: Not Permitted.

- C. Requests for substitutions will be considered in accordance with provisions specified in Section 01 62 00 – Product Options.

2.2 EXTERIOR SYNTHETIC TRIM

- A. Exterior Synthetic (Poly-ash) Trim: TruExterior® Trim.
- B. Composition:
 - 1. Post-Industrial Recycled Content: Minimum 70 percent, by weight.
 - 2. Post-Consumer Recycled Content: Minimum 2 percent, by weight.
 - 3. Pigments and dyes.
- C. Physical Properties:
 - 1. Density, ASTM C1185: 40 to 50 pounds per cubic foot (1.92 to 2.39 kilopascals).
 - 2. Water Absorption, ASTM D570: Less than 1.5 percent.
 - 3. Fungi Rot: Conforming to AWWA E10:
 - 4. White Rot: Negligible loss.
 - 5. Brown Rot: Negligible loss.
 - 6. Termite Resistance, AWWA E1: Greater than 9.0, with 10 being impervious.
- D. Mechanical Properties:
 - 1. Flexural Strength, ASTM C1185: Greater than 1,600 pounds per square inch (11 032 kilopascals).
 - 2. Nail Withdrawal, ASTM D1761: Greater than 40 pound force inch (4.5 newton-meter).
- E. Thermal Properties:
 - 1. Coefficient of Linear Expansion, ASTM D6341, Typical: 1.40E-05 inch/inch/degree Fahrenheit (2.52E-05 millimeter/millimeter/degree Celsius), tested at minus 30 to 140 degrees Fahrenheit (-34.4 and 60 degrees Celsius).
 - 2. Flame Spread, ASTM E84: Between 25 and 29.
 - 3. Smoke Developed, ASTM E84: Less than 450.
- F. Trim Sizes:
 - 1. Trim Sizes:
 - 2. Nominal Size: 1 inch by 4 inches (25.4 millimeters by 101.6 millimeters). Actual Size: 3/4 inches by 3-1/2 inches (19.1 millimeters by 88.9 millimeters).
 - 3. Nominal Size-1: 1 inch by 6 inches (25.4 millimeters by 152.4 millimeters). Actual Size: 3/4 inches by 5-1/2 inches (19.1 millimeters by 139.7 millimeters).
 - 4. Exposed Texture: **[Woodgrain]** or Smooth.

2.3 FABRICATION

- A. Manufacturing Tolerances:

1. Width: Plus or minus 1/16 inches (1.6 millimeters).
2. Thickness: Plus or minus 1/16 inches (1.6 millimeters).
3. Length: Plus 2 inches (50.8 millimeters), minus 0 inches.
4. Edge Cut: Plus or Minus 2 degrees.

2.4 FINISHES

A. Primer:

1. Acrylic based.
2. Low volatile organic compound (VOC).
3. Factory applied on all sides.

2.5 FASTENERS

- A. Specify minimum 16 gauge fasteners with head and finish suitable for the project environment and specific application. Fasteners should be installed with adequate penetration to hold solid substrate.
- B. Type: Nails, , or .
1. Size: Ensure a minimum of 1 inch embed into solid sub-framing
 2. Finish: , Stainless steel .

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive exterior synthetic trim.
- B. Notify Architect of conditions that would adversely affect installation or use.
- C. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION

- A. Install exterior synthetic trim in accordance with manufacturer's instructions at locations indicated on the Drawings.
- B. Exterior synthetic trim must not be installed in structural or load-bearing applications.
- C. Install exterior synthetic trim plumb, level, square, and with flush, tight joints.
- D. Fasteners must be installed a maximum of 24 inches (609.6 millimeters) on center and within 2 inches (50.8 millimeters) of the end of boards.

- E. Nail and screw holes are to be filled with acrylic caulk, wood filler, or autobody filler.
- F. Minor damages to exterior synthetic trim are to be repaired in accordance with manufacturer's instructions and approved by Architect. Damage that cannot be successfully repaired as determined by Architect must be removed and replaced.
- G. Painting:
- H. Apply topcoat to exterior synthetic trim over factory-applied primer. TruExterior® Trim must be painted over the factory-applied primer or the warranty will be void.
- I. Within 150 days of installing trim.
- J. As specified in Section 09 91 00.

3.3 PROTECTION

- A. Protect installed exterior synthetic trim to ensure that, except for normal weathering, trim will be without damage or deterioration at the of Substantial Completion.

END OF SECTION 066500

SECTION 072100.10 - THERMAL INSULATION (WOOD FIBER)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood fiber batt insulation. (TimberBatt)

1.2 REFERENCES

A. ASTM International (ASTM):

1. ASTM C 208 - Standard Specification for Cellulosic Fiber Insulating Board.
2. ASTM C 209 - Standard Test Methods for Cellulosic Fiber Insulating Board.
3. ASTM C 739 - Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation.
4. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. Code of Federal Regulations (CFR)

1. CFR 16 Part 1209 Interim Safety Standard for Cellulose Insulation.

C. Forest Stewardship Council (FSC)

1. STD-40-003 Standard for Multi-site Certification of Chain of Custody Operations.
2. STD-40-004 V2.0 FSC Standard for Chain of Custody Certification.
3. STD-40-005 V2.1 Standard for Company Evaluation of FSC Controlled Wood.

1.3 SUBMITTALS

A. Product Data:

1. Manufacturer's data sheets on each product to be used.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Typical installation methods.

B. Sustainable Design Submittals: Manufacturer's documentation that wood fiber is FSC certified by the Forest Stewardship Council Standards STD-40-003, STD-40-004, STD-40-005.

C. Verification Samples: Two representative units of each type.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle products per manufacturer's instructions until ready for installation.

1.5 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.6 WARRANTY

- A. Insulation Warranty: At project closeout, submit to Owner an executed copy of the manufacturer's standard limited warranty against manufacturing defects.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: TimberHP, which is located at: 1 Main St. P. O. Box 119; Madison, ME 04950; Toll Free Tel: 855-755-1359; Email: request info (info@timberhp.com); Web: <https://timberhp.com>
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

2.2 WOOD FIBER BATT INSULATION

- A. Wood Fiber Batt Insulation: TimberBatt by TimberHP with the following attributes.
 - 1. Description: Press-fit batt insulation for wood frame and steel stud cavities.
 - 2. Contents: Wood fibers, polyamide fibers, boric acid.
 - 3. Sustainability: FSC-certified softwood.
 - 4. R-Value: 4.0 per inch.
 - 5. Vapor Permeability: 46 perm-inch.
 - 6. Acoustic Performance: NRC 1.15 at 5-1/2 inches (140 mm) thick.
 - 7. Fire Protection: ASTM E84 Class A flame spread and smoke developed.
 - 8. Standards: Meets applicable ASTM C739 requirements - Standard Specification for Cellulosic Fiber-Fill Thermal Insulation.
 - 9. Wall Batt R-Value: R-12, 3 inches (76.2mm) thickness.
 - 10. Wall Batt R-Value-1: R-14, 3.5 inches (88.9mm) thickness.
 - 11. Wall Batt R-Value-2: R-22, 5.5 inches (139.7mm) thickness.
 - 12. Wall Batt R-Value-3: R-24, 6 inches (152.4mm) thickness.
 - 13. Wall Batt R-Value-4: R-30, 7.25 inches (184.15mm) thickness.

14. Wall Batt Width, Wood Studs: 15 inches (381mm) and 23 inches (584.2mm).
15. Wall Batt Length, Wood Studs: 47 inches (1193.8mm).
16. Attic Batt R-Value: R-13, Initial thickness 3.8 inches (96.5mm), settled thickness 3.4 inches (86.4mm).
17. Attic Batt R-Value-1: R-19, Initial thickness 5.6 inches (142.2mm), settled thickness 5.0 inches (127.0mm).
18. Attic Batt R-Value-2: R-22, Initial thickness 6.4 inches (162.5mm), settled thickness 5.8 inches (147.3mm).
19. Attic Batt R-Value-3: R-26, Initial thickness 7.6 inches (193mm), settled thickness 6.8 inches (172.7mm).
20. Attic Batt R-Value-4: R-30, Initial thickness 8.8 inches (223.5mm), settled thickness 7.9 inches (200.6mm).
21. Attic Batt R-Value-5: R-32, Initial thickness 9.3 inches (236.2mm), settled thickness 8.4 inches (213.3mm).
22. Attic Batt R-Value-6: R-38, Initial thickness 11.1 inches (281.9mm), settled thickness 10.0 inches (254.0mm).
23. Attic Batt R-Value-7: R-40, Initial thickness 11.7 inches (297.2mm), settled thickness 10.5 inches (266.7mm).
24. Attic Batt R-Value-8: R-44, Initial thickness 12.9 inches (327.6mm), settled thickness 11.6 inches (294.6mm).
25. Attic Batt R-Value-9: R-48, Initial thickness 14.0 inches (355.6mm), settled thickness 12.6 inches (320.0mm).
26. Attic Batt R-Value-10: R-49, Initial thickness 14.3 inches (363.2mm), settled thickness 12.9 inches (327.6mm).
27. Attic Batt R-Value-11: R-50, Initial thickness 18.0 inches (457mm), settled thickness 16.2 inches (411.5mm).
28. Batt Width, Steel Studs: 16 inches (406.4mm) and 24 inches (mm).
29. Batt Length, Steel Studs: 48 inches (609.6mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly constructed and prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install products in accordance with manufacturer's instructions, approved submittals and in proper relationship with adjacent construction.
 - 1. Install insulation that is dry and undamaged.
 - 2. Cut and fit insulation tightly around obstructions.
 - 3. Install continuously, without gaps.

3.4 CLEANING AND PROTECTION

- A. Clean products in accordance with the manufacturers recommendations.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 072100.10

SECTION 073113 - ASPHALT SHINGLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Glass-fiber-reinforced asphalt shingles.
 - 2. Underlayment materials.
 - 3. Ridge vents.
 - 4. Metal flashing and trim.
- B. Related Requirements:
 - 1. Section 077200 "Roof Accessories" for roof ventilators.

1.2 ALLOWANCES

- A. See Section 012100 "Allowances" for description of allowances affecting items specified under this Section.

1.3 UNIT PRICES

- A. See Section 012200 "Unit Prices" for description of unit prices affecting items specified under this Section.

1.4 ALTERNATES

- A. See Section 012300 "Alternates" for description of alternates affecting items specified under this Section.

1.5 DEFINITIONS

- A. Roofing Terminology: See ASTM D1079 for definitions of terms related to roofing Work in this Section.

1.6 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Asphalt shingles.
 - 2. Underlayment materials.

3. Ridge vents.
4. Asphalt roofing cement.
5. Elastomeric flashing sealant.

B. Samples: For each exposed product and for each color and blend specified, in sizes indicated.

1. Asphalt Shingles: Full size.
2. Ridge and Hip Cap Shingles: Full size.
3. Ridge Vent: **12-inch-** long Sample.
4. Exposed Valley Lining: **12 inches** square.

C. Samples for Initial Selection:

1. For each type of asphalt shingle indicated.
2. For each type of accessory involving color selection.

D. Samples for Verification: For the following products, in sizes indicated:

1. Asphalt Shingles: Full size.
2. Ridge and Hip Cap Shingles: Full size.
3. Ridge Vent: **12-inch-** long Sample.
4. Exposed Valley Lining: **12 inches** square.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For asphalt shingles to include in maintenance manuals.
- B. Materials warranties.
- C. Roofing Installer's warranty.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Asphalt Shingles: **100 sq. ft.** of each type and in each color and blend, in unbroken bundles.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized installer who is trained and approved by manufacturer.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing materials in a dry, well-ventilated location protected from weather, sunlight, and moisture in accordance with manufacturer's written instructions.
- B. Store underlayment rolls on end, on pallets or other raised surfaces. Do not double-stack rolls.
- C. Protect unused roofing materials from weather, sunlight, and moisture when left overnight or when roofing Work is not in progress.
- D. Handle, store, and place roofing materials in a manner to prevent damage to roof deck or structural supporting members.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with installation only when existing and forecasted weather conditions permit product installation and related Work to be performed in accordance with manufacturer's written instructions and warranty requirements.
 - 1. Install self-adhering, polymer-modified bitumen sheet underlayment within the range of ambient and substrate temperatures recommended in writing by manufacturer.

1.12 WARRANTY

- A. Materials Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Manufacturing defects.
 - 2. Materials Warranty Period: 25 years from date of Substantial Completion, prorated, with first five years nonprorated.
 - 3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to **100 mph** for five years from date of Substantial Completion.
 - 4. Algae-Resistance Warranty Period: Asphalt shingles will not discolor for 20 years from date of Substantial Completion.
 - 5. Workmanship Warranty Period: Two years from date of Substantial Completion.
- B. Roofing Installer's Warranty: On warranty form at end of this Section, signed by Installer, in which Installer agrees to repair or replace components of asphalt shingle roofing that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of product from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance in accordance with ASTM E108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
- B. Wind Resistance: Provide asphalt shingles that comply with requirements of ASTM D3161/D3161M, Class F, and with ASTM D7158/D7158M, Class H.
- C. Energy Performance, ENERGY STAR: Provide asphalt shingles that are listed on the DOE's "ENERGY STAR Roof Product List" for steep-slope roof products.

2.3 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Laminated-Strip Asphalt Shingles: ASTM D3462/D3462M, laminated, multi-ply overlay construction; glass-fiber reinforced, mineral-granule surfaced, and self-sealing.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Insert manufacturer's name; product name or designation or comparable product by one of the following:
 - a. CertainTeed; SAINT-GOBAIN
 - 2. Butt Edge: Straight cut.
 - 3. Strip Size: Manufacturer's standard.
 - 4. Algae Resistance: Granules resist algae discoloration.
 - 5. Color and Blends: As selected by Architect from manufacturer's full range.
- B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.4 UNDERLAYMENT MATERIALS

- A. Synthetic Underlayment: UV-resistant polypropylene, polyolefin, or polyethylene polymer fabric with surface coatings or treatments to improve traction underfoot and abrasion resistance; evaluated and documented to be suitable for use as a roof underlayment under applicable codes by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide

CertainTeed; Saint-Gobain North America: DiamondDeck or comparable product by one of the following:

- a. CertainTeed; SAINT-GOBAIN

2.5 RIDGE VENTS

- A. Flexible Ridge Vent: Manufacturer's standard, compression-resisting, three-dimensional, open-nylon or polyester-mat filter bonded to a nonwoven, nonwicking, geotextile fabric cover.
 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. Air Vent, Inc.; Gibraltar Industries, Inc.
 - b. Owens Corning
 - c. Insert Manufacturers Name
 - d. Insert Manufacturers Name

2.6 ACCESSORIES

- A. Roofing Nails: ASTM F1667, aluminum, stainless steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum **0.120-inch-** diameter, sharp-pointed, with a **3/8- to 7/16-inch-** diameter flat head and of sufficient length to penetrate **3/4 inch** into solid wood decking or extend at least **1/8 inch** through sheathing less than **3/4 inch** thick.
 1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- B. Underlayment Nails: Aluminum, stainless steel, or hot-dip galvanized-steel wire nails with low-profile metal or plastic caps, **1-inch-** minimum diameter.
 1. Provide with minimum **0.0134-inch-** thick metal cap, **0.010-inch-** thick power-driven metal cap, or **0.035-inch-** thick plastic cap; and with minimum **0.083-inch-** thick ring shank or **0.091-inch-** thick smooth shank of length to penetrate at least **3/4 inch** into roof sheathing or to penetrate through roof sheathing less than **3/4 inch** thick.

2.7 METAL FLASHING AND TRIM

- A. Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
 1. Sheet Metal: Aluminum, mill finished.
- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item unless otherwise specified in this Section or indicated on

Drawings.

1. Drip Edges: Fabricate in lengths not exceeding 10 feet with minimum 2-inch roof-deck flange and 1-1/2-inch fascia flange with 3/8-inch drip at lower edge.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored and that provisions have been made for flashings and penetrations through asphalt shingles.
 3. Verify that vent stacks and other penetrations through roofing are installed and securely fastened.
- 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 OF UNDERLAYMENT MATERIALS

- A. Comply with asphalt shingle and underlayment manufacturers' written installation instructions and with recommendations in NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems" applicable to products and applications indicated unless more stringent requirements are specified in this Section or indicated on Drawings.
- B. Synthetic Underlayment:
 1. Install on roof deck parallel with and starting at the eaves.
 - a. Lap sides and ends as recommended in writing by manufacturer, but not less than 4 inches for side laps and 6 inches for end laps.
 - b. Stagger end laps between succeeding courses at interval recommended in writing by manufacturer, but not less than 72 inches.
 - c. Fasten with underlayment nails in accordance with manufacturer's written instructions.
 - d. Cover underlayment within period recommended in writing by manufacturer.
 2. Install in double layer on roofs sloped at less than 4:12.
 3. Install synthetic underlayment on roof deck not covered by self-adhering,

polymer-modified bitumen sheet unless otherwise specified in this Section or indicated on Drawings.

- a. Lap sides of underlayment over self-adhering sheet not less than **4 inches** in direction to shed water.
 - b. Lap ends of underlayment not less than **6 inches** over self-adhering sheet.
4. Terminate synthetic underlayment flush against sidewalls, curbs, chimneys, and other roof projections.

3.3 INSTALLATION OF METAL FLASHING AND TRIM

- A. Install metal flashings and trim to comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
1. Install metal flashings in accordance with recommendations in ARMA's "Asphalt Roofing Residential Manual - Design and Application Methods" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
 2. Bed flanges of metal flashings using asphalt roofing cement or elastomeric flashing sealant.
- B. Rake Drip Edges: Install over underlayment materials and fasten to roof deck.
- C. Eave Drip Edges: Install below underlayment materials and fasten to roof deck.
- D. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.4 INSTALLATION OF ASPHALT SHINGLES

- A. Install asphalt shingles in accordance with manufacturer's written instructions and recommendations in ARMA's "Asphalt Roofing Residential Manual - Design and Application Methods" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
- B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip at least **7 inches** wide with self-sealing strip face up at roof edge.
1. Extend asphalt shingles **1/2 inch** over fasciae at eaves and rakes.
 2. Install starter strip along rake edge.
- C. Install first and remaining courses of three-tab-strip asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- D. Fasten asphalt shingle strips with a minimum of five roofing nails, but not less than the number indicated in manufacturer's written instructions for roof slope and design wind speed indicated on Drawings and for warranty requirements specified in this Section.

1. Locate fasteners in accordance with manufacturer's written instructions.
 2. Where roof slope is less than 4:12, hand seal self-sealing asphalt shingles to improve the shingles' positive bond by applying asphalt roofing cement spots between course overlaps after nailing the upper course.
 3. When ambient temperature during installation is below 50 deg F, hand seal self-sealing asphalt shingles by applying asphalt roofing cement spots between course overlaps after nailing the upper course.
- E. Ridge Vents: Install continuous ridge vents over asphalt shingles in accordance with manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.
- F. Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing-shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds.
1. Fasten with roofing nails of sufficient length to penetrate sheathing.
 2. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

END OF SECTION 073113

SECTION 074113.16 - STANDING-SEAM METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vertical-rib, snap-joint, standing-seam metal roof panels.
2. Clipless, standing-seam metal roof panels.
3. Underlayment.

B. Related Requirements:

1. Section 077253 "Snow Guards" for prefabricated devices designed to hold snow on the roof surface, allowing it to melt and drain off slowly.

1.2 DEFINITIONS

- A. Structural Standing-Seam Metal Roof Panel System: A roof system designed to resist positive and negative loads applied normal to the metal roof panel surface without the benefit of a supporting deck or sheathing.

1.3 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal roof panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.4 ACTION SUBMITTALS

A. Product Data:

1. For standing-seam metal roof panels. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

- B. Samples for Initial Selection: Manufacturer's standard color charts, showing full range of available colors for each type of exposed finish.

1. Include similar Samples of trim and accessories involving color selection.

- C. Samples for Verification: Actual sample of finished products for each type of exposed finish for metal roof panels and metal panel accessories.

- 1. Size: Manufacturers' standard size.

1.5 QUALITY ASSURANCE

- A. Roof Installer Qualifications: Entity that employs a supervisor who is an NRCA ProCertified Roofing Foreman or installers who are NRCA ProCertified Metal Panel Roof Systems Installers.
- B. Portable Roll-Forming Equipment Certification: UL-certified, portable roll-forming equipment capable of producing metal roof panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of Work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal roof panels, and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.
- B. Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal roof panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness, with positive slope for drainage of water. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal roof panels during installation.
- E. Copper Roof Panels: Wear gloves when handling to prevent fingerprints and soiling of surface.

1.7 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal roof panels to be performed in accordance with manufacturers' written installation instructions and warranty requirements.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metal roof panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metal and other materials beyond normal weathering.
 2. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer agrees to repair finish or replace metal roof 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 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 2. Finish Warranty Period: 20 years from date of Substantial Completion.
- C. Special Weathertightness Warranty: Manufacturer agrees to repair or replace standing-seam metal roof panel systems that fail to remain weathertight, including leaks, within specified warranty period.
1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal roof panel systems capable of withstanding the effects of the following loads when tested in accordance with ASTM E1592:
1. Wind Loads: As indicated on Drawings.
 2. Other Design Loads: As indicated on Drawings.
 3. Structural Standing-Seam Steel Roof Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.

2.2 STANDING-SEAM METAL ROOF PANELS, GENERAL

- A. Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with seamed joint type indicated and mechanically attaching panels to supports using concealed fasteners in side laps. Include all accessories required for weathertight installation.

2.3 VERTICAL-RIB, SNAP-JOINT, STANDING-SEAM METAL ROOF PANELS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Everlast Metals: Everloc® or comparable product by one of the following:
 - 1. Everlast Metals
 - 2. Everlast Metals: SSL175
- B. Metal Roof Panels: Formed with vertical ribs at panel edges; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and snapping panels together.
 - 1. Structural Support: Over solid deck.
 - 2. Material: Metallic-coated steel.
 - 3. Panel Profile: Everloc®.
 - 4. Panel Coverage: 10 inches 14 inches 18 inches.
 - 5. Panel Height: 1.75 inches.
 - 6. Clips: One piece, fixed, designed to accommodate thermal movement.
 - a. Stainless Steel Clips: 0.0250-inch- thick, stainless steel sheet.
 - b. Clip Spacing: 24 inches.

2.4 METAL ROOF PANEL MATERIAL

- A. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with minimum ASTM A653/A653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with minimum ASTM A792/A792M, Class AZ50 coating designation; structural quality. Sheet prepainted by the coil-coating process to comply with ASTM A755/A755M.
 - 1. Nominal Thickness: 0.022 inch.
 - 2. Surface: Smooth, flat texture.
 - 3. Exterior Finish: Three-coat fluoropolymer.
 - 4. Color: Ivy 1532.

2.5 UNDERLAYMENT

- A. Felt Underlayment: ASTM D226/D226M, Type II (No. 30), asphalt-saturated organic felts.
- B. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.6 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C645; cold-formed, metallic-coated steel sheet, minimum ASTM A653/A653M, G90 hot-dip galvanized coating designation or ASTM A792/A792M, Class AZ50 coating designation. Provide

manufacturer's standard sections as required for support and alignment of metal panel system.

- B. Flashing and Trim: Provide flashing and trim formed from same material as metal roof panels 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. Finish flashing and trim with same finish system as adjacent metal roof panels.
- C. Roof Panel Fasteners: Self-tapping screws designed to withstand design loads.

2.7 FABRICATION

- A. Fabricate and finish metal roof panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-site Fabrication: Subject to compliance with requirements of this Section, metal roof panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate in accordance with equipment manufacturer's written instructions and to comply with details shown.
- C. Provide roof panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal roof panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations that apply to design, dimensions, metal, and other characteristics of item indicated.
 - 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.
 - 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 - 3. Seams for other than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with manufacturer's recommendations.
 - 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not permitted on faces of accessories exposed to view.
 - 6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal roof panel manufacturer.

- a. Size: As recommended by metal roof panel manufacturer for application, but not less than thickness of metal being secured.

2.8 FINISHES

- A. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. 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 same piece are unacceptable. 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.
- C. Steel Roof Panels and Accessories:
 1. Three-Coat Fluoropolymer: Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions for seacoast and severe environments.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the Work.
 1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
 2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages in accordance with ASTM C754 and metal roof panel manufacturer's written installation instructions.

3.3 INSTALLATION OF ROOF INSULATION

- A. General: Install insulation concurrently with metal roof panel installation, in thickness indicated to cover entire surface, in accordance with manufacturer's written installation 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.
- B. Blanket Roof Insulation: Comply with the following installation method:
 - 1. Over-Framing Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal roof panels fastened to secondary framing.
 - 2. Between-Purlin 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. Hold in place with bands and crossbands below insulation.

3.4 INSTALLATION OF COVER BOARD

- A. Install cover board over insulation in accordance with manufacturer's written installation instructions. Install with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of **6 inches** in each direction.

3.5 INSTALLATION OF STANDING-SEAM METAL ROOF PANELS

- A. Install metal roof panels in accordance with manufacturer's written installation instructions and approved Shop Drawings in orientation, sizes, and locations indicated. Anchor metal roof panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 1. Shim or otherwise plumb substrates receiving metal roof panels.
 - 2. Flash and seal metal roof panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal roof panels are installed.
 - 3. Install screw fasteners in predrilled holes.
 - 4. Locate and space fastenings in uniform vertical and horizontal alignment.

5. Install flashing and trim as metal roof panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Align bottoms of metal roof panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
1. Steel Roof Panels: Use stainless steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
 2. Aluminum Roof Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
 3. Stainless Steel Roof Panels: Use stainless steel fasteners.
 4. Copper Roof Panels: Use copper, stainless steel, or hardware-bronze fasteners.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal roof panel manufacturer.
- D. Concealed Clip, Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
1. Install clips to supports with self-tapping fasteners.
 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
- E. Clipless, Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with screw fasteners at each lapped joint at location and spacing recommended by manufacturer.
- F. Roof Panel Joints: Fasten panel joints to substrate in accordance with manufacturer's instructions.
1. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
 2. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
 3. Watertight Installation:
 - a. Apply a continuous ribbon of sealant or tape to seal joints of metal roof panels, using sealant or tape as recommended in writing by manufacturer as needed to make panels watertight.
 - b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 - c. At panel splices, nest panels with minimum **6-inch** end lap, sealed with sealant and fastened together by interlocking clamping plates.

- G. Accessory Installation: 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 system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.
- H. Flashing and Trim: Comply with performance requirements and manufacturer's written installation instructions. 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 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 achieve 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 ft.** with no joints allowed within **24 inches** of corner or intersection. Where lapped 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).
- I. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than **36 inches** o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- J. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely **1 inch** away from walls; locate fasteners at top and bottom and at approximately **60 inches** o.c. in between.
 - 1. Provide elbows at base of downspouts to direct water away from building.
 - 2. Connect downspouts to underground drainage system indicated.
- K. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet metal roof panels.
- L. Pipe and Conduit Penetrations: Fasten and seal to metal roof panels as recommended by manufacturer.

3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal roof panels within installed tolerance of **1/4 inch in 20 ft.** on slope and location lines as indicated and within **1/8-inch** offset of adjoining faces and of alignment of matching profiles.

3.7 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.
- C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

3.8 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113.16

SECTION 074624 - WOOD CLAPBOARD AND SHIPLAP SIDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood clapboard siding
2. Thermally modified wood cladding
3. Siding Vents

B. Related Requirements:

1. Section 062013 "Exterior Finish Carpentry" for wood exterior-wall trim.
2. Section 072500 "Weather Barriers" for weather-resistive barriers and flexible flashing.
3. Section 076200 "Sheet Metal Flashing and Trim" for metal flashing and trim installed with siding.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Wood clapboard siding
2. Thermally modified wood cladding

B. Samples for Verification: For the following products, of sizes indicated, to verify color and finish selected.

1. Wood Clapboard: 16 inch long piece
2. Thermally modified: 16 inch long piece

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store siding in a dry, well-ventilated, weathertight location in accordance with manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

1. Product Identification: Attach a label to each bundle of wood products that includes the following:

- a. Identification mark of testing agency acceptable to authorities having jurisdiction.
- b. Identification of treating manufacturer, chemical treatment, method of application, purpose of treatment, and warranties available.
- c. Species of wood.
- d. Flame-spread and smoke-developed indexes.
- e. Method of drying after treatment.
- f. The words "No increase in the listed classification when subjected to the Standard Rain Test."
- g. References to model-code approval.

2.2 THERMALLY MODIFIED WOOD CLADDING

A. Thermally Modified Spruce Cladding - Spruce

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. ThermoryUSA, www.thermoryusa.com,
 - b. Lunawood www.Lunawood.com
2. Interior finish boards, walls and ceilings. See drawings for extents
 - a. Size: Nominal size 1 x 6 inches.
 - b. Actual size: 0.79 inches x 5.6 inches.
 - c. Profile: Tongue and groove edges, joint end matched
 - d. Finish: apply one coat of Seal-Once, NANO after installed to all exposed surfaces
 - e. Install: Per manufacturer recommendation. Blind nail through tongue with stainless steel ring shank nail
3. Exterior Soffits and vertical exterior walls
 - a. Size: Nominal size 1 x 8 inches.
 - b. Actual size: 0.79 inches x 7.3 inches
 - c. Profile: Shiplap, joint end matched
 - d. Finish: Unoleed
 - e. Install:
 - 1) Vertical Exterior Wall:
 - a) Install vertically, on ¾" Cor-A-Vent Rainscreen,
 - b) Face nail using stainless ring-shank nails

2.3 WOOD CLAPBOARD SIDING

A. Smooth-Sawn Cedar clapboard:

1. Grade: No. 1
2. Size: 7 1/4 inch width and 3/8 inch at butt. Installed with 6" exposure.
3. Finish: Primed all four sides
4. Install: Install using trim head stainless steel ring-shank nails per manufacturer.
 - a. Color: Oxford Brown

2.4 SIDING VENTILATION (RAINSCREEN)

A. Ventilated Rainscreen Siding Vent

1. Manufacturer: By the following but not limited to :Cor-A-Vent, Inc.; P.O. Box 428; Mishawaka, IN 46546-0428. ASD. Tel: (800) 837-8368. Fax: (800) 645-6162.
 - a. U.Siding Vents: SV-5.
 - 1) Net free area: 8.75 sq in per lin ft (17994 sq mm/m).
 - 2) Dimensions: 3/4 inches (18.75mm) wide by 48 inches (1220 mm) long by 3 inch (75 mm) high.
 - 3) Color: Black.

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. 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. Install products in accordance with manufacturer's written instructions and recommendations in CSSB's "Exterior and Interior Wall Manual."
- B. Siding Vents
 1. Nail SV-3 or SV-5 in a continuous band along the wall at the level where the siding will start. A continuous band of SV-3 or SV-5 may also be nailed at the top

of the wall where the siding ends if full ventilation behind the siding is desired.
SV-3 and SV-5 may also be used above and below windows and above doors to
provide drainage/ventilation in these areas as well.

END OF SECTION 074624

SECTION 077253 - SNOW GUARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rail-type, seam-mounted snow guards.

1.2 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

1. Pad-type, flat-mounted metal snow guards.
2. Pad-type, flat-mounted plastic snow guards.
3. Pad-type, seam-mounted cast-metal snow guards.
4. Pad-type, seam-mounted plastic snow guards.
5. Rail-type, flat-mounted snow guards.
6. Rail-type, seam-mounted snow guards.

B. Shop Drawings: Include roof plans showing layouts and attachment details of snow guards.

1. Include details of rail-type snow guards.

C. Samples:

1. Rail-Type Snow Guards: Bracket, **12-inch-** long rail, and installation hardware.
 - a. For units with factory-applied finishes, submit manufacturer's standard color selections.

D. Delegated Design Submittals: For snow guards, include analysis reports signed and sealed by the qualified professional engineer responsible for their preparation.

1. Include calculation of number and location of snow guards.

1.3 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit adhesive-mounted snow guards to be installed, and adhesive cured, according to adhesive manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design snow guards, including attachment to roofing material and roof deck, as applicable for attachment method, based on the following:
1. Roof snow load.
 2. Snow drifting
 3. Roof slope.
 4. Roof type.
 5. Roof dimensions.
 6. Roofing substrate type and thickness.
 7. Snow guard type.
 8. Snow guard fastening method and strength.
 9. Snow guard spacing.
 10. Coefficient of Friction Between Snow and Roof Surface: 0.
 11. Factor of Safety: 3.
- B. Performance Requirements: Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 RAIL-TYPE SNOW GUARDS

- A. Rail-Type, Seam-Mounted Snow Guards:
1. Basis-of-Design Product: Subject to compliance with requirements, provide TRA Snow and Sun, Inc.: C-2-1-Z Clamp On (C2 Series) or comparable product by one of the following:
 - a. TRA Snow and Sun, Inc.: C-2-1-Z Clamp On (C2 Series)
 2. Description: Snow guard rails fabricated from metal pipes, bars, or extrusions, anchored to brackets and equipped with one rail.
 3. Brackets and Baseplate: ASTM B209 aluminum; mill finished.
 4. Bars: ASTM B221 aluminum; mill finish.
 - a. Profile: Round.
 5. Seam Clamps: ASTM B221 aluminum extrusion or ASTM B85/B85M aluminum casting with stainless steel set screws incorporating round nonpenetrating point; designed for use with applicable roofing system to which clamp is attached.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, snow guard attachment, and other conditions affecting performance of the Work.
 - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean and prepare substrates for bonding snow guards.
- B. Prime substrates according to snow guard manufacturer's written instructions.

3.3 INSTALLATION

- A. Install snow guards according to manufacturer's written instructions.
 - 1. Space rows as indicated on Shop Drawings.
 - 2. Space rows as recommended by manufacturer.
- B. Attachment for Standing-Seam Metal Roofing:
 - 1. Do not use fasteners that will penetrate metal roofing or fastening methods that void metal roofing finish warranty.
 - 2. Rail-Type, Seam-Mounted Snow Guards:
 - a. Install brackets to vertical ribs in straight rows.
 - b. Secure with stainless steel set screws, incorporating round nonpenetrating point, on same side of standing seam.
 - c. Torque set screw in accordance with manufacturer's written instructions.
 - d. Install cross members to brackets.
- C. Attachment for Exposed Fastened Metal Roofing:
 - 1. Do not use fasteners that will void metal roofing finish warranty.
 - 2. Pad-Type, Flat-Mounted Snow Guards:
 - a. Adhere to metal roofing in accordance with manufacturer's written instructions.
 - b. Mechanically fasten to metal roofing, using fasteners identical to those used to secure metal roofing to substrate.
 - c. Solder to copper roofing in accordance with manufacturer's written

instructions.

3. Rail-Type, Flat-Mounted Snow Guards:

- a. Install brackets in straight rows.
- b. Mechanically fasten to metal roofing, using sealant and mechanical fasteners identical to those used to secure metal roofing to substrate.
- c. Install cross members to brackets.

D. Attachment for Everloc® Roofing:

END OF SECTION 077253

SECTION 080671 – DOOR HARDWARE SCHEDULE

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 references specification sections relating to commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Sliding Doors.
 - 3. Other doors to the extent indicated.
- B. Commercial door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical and access control door hardware.
 - 3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
 - 4. Automatic operators.
 - 5. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section "Door Hardware".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 - 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.
- D. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.
- F. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.5 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.6 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Refer to "PART 3 – EXECUTION" for required specification sections.

PART 3 - EXECUTION

3.1 DOOR HARDWARE SETS

- A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
1. Quantities listed are for each pair of doors, or for each single door.
 2. The supplier is responsible for handing and sizing all products.
 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Products listed in the hardware sets shall be supplied by and in accordance with the requirements described in the specification section as noted for each item.
1. Section 08 71 00 – Door Hardware.
- C. Manufacturer's Abbreviations:
1. MK - McKinney
 2. RO - Rockwood
 3. RU - Corbin Russwin
 4. RF - Rixson
 5. PE - Pemko
 6. OT - Other
 7. JO - Johnson Hardware

Hardware Sets

Set: 1.0

Doors: S01

2 Door Pull	BF107FBPC - Type 1	FBCP	RO 087100
Fascia Track	2610F72H		JO

Set: 2.0

Doors: [E01](#)

3 Hinge, Full Mortise, Ext	TA2314 [NRP]	US32D	MK 087100
1 Storeroom Lock	ML2057 PSF CT6R	626	RU 087100
1 Permanent Core	To Match Existing System	626	RU 087100
1 Heavy Conc OH Stop	1-_36	652	RF 087100
1 Surface Closer	DC6210 A3	689	RU 087100
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO 087100
1 Gasketing	Integral In Frame Assembly		OT
1 Rain Guard	346C (Omit at Overhang)		PE 087100
1 Sweep	18061CNB		PE 087100
1 Threshold	273x224AFGT		PE 087100

Set: 3.0

Doors: [E02](#), [E03](#)

3 Hinge, Full Mortise, Ext	TA2314 [NRP]	US32D	MK 087100
1 Dormitory Lock	ML2065 PSF V21 CT6R	626	RU 087100
1 Permanent Core	To Match Existing System	626	RU 087100
1 Surface Closer	DC6200 A10	689	RU 087100
1 Wall/Floor Stop	409 [OR] 441	US26D	RO 087100
1 Gasketing	Integral In Frame Assembly		OT
1 Rain Guard	346C (Omit at Overhang)		PE 087100
1 Sweep	18061CNB		PE 087100
1 Threshold	273x224AFGT		PE 087100

Set: 4.0

Doors: [E04](#)

3 Hinge, Full Mortise, Int	TA2714 [NRP]	US26D	MK 087100
1 Passage Latch	ML2010 PSF	626	RU 087100
1 Conc Overhead Stop	5-_36	652	RF 087100
1 Surface Closer	DC6200 A10	689	RU 087100
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO 087100

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1 Gasketing [S88BL](#)

PE 087100

END OF SECTION 080671

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

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. Standard and custom hollow metal doors and frames.
 - 2. Steel sidelight, borrowed lite and transom frames.
 - 3. Louvers installed in hollow metal doors.
 - 4. Light frames and glazing installed in hollow metal doors.

- B. Related Sections:

- 1. Division 01 Section "General Conditions".
 - 2. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
 - 3. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
 - 4. Division 08 Section "Door Hardware".
 - 5. Division 09 Sections "Exterior Painting" and "Interior Painting" for field painting hollow metal doors and frames.

- C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

- 1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
 - 2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
 - 3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
 - 4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
 - 5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
 - 6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
- B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".
- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40" above sill) or UL 10C.
 1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
 2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
 3. Smoke Control Door Assemblies: Comply with NFPA 105.
 - a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
- D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.

- E. Storm Shelter Openings: Provide complete door systems for hurricane or tornado storm shelters, and other areas of refuge, complying and tested according to ICC 500 (2014/2020), ICC/NSSA Standard for the Design and Construction of Storm Shelters.
 - 1. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- F. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
 - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.6 COORDINATION

- A. Coordinate installation of anchorages 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.
- B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:
 - 1. CECO Door Products (C).
 - 2. Curries Company (CU).

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.3 HOLLOW METAL DOORS

- A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.
- B. Exterior Doors (Energy Efficient): Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, ANSI/SDI A250.4 for physical performance level, and HMMA 867 for door construction.
 - 1. Design: Flush panel.
 - 2. Core Construction: Foamed in place polyurethane and steel stiffened laminated core with no stiffener face welds, in compliance with HMMA 867 "Laminated Core".

- a. Provide 22-gauge steel stiffeners at 6 inches on-center internally welded at 5" on-center to integral core assembly, foamed in place polyurethane core chemically bonded to all interior surfaces. No stiffener face welding is permitted.
 - b. Thermal properties to rate at a fully operable minimum U-Factor 0.37 and R-Value 2.7, including insulated door, thermal-break frame and threshold.
 - c. Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.38 and R-Value 2.6, including insulated door, kerf type frame, and threshold.
 3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053 inch - 1.3-mm) thick steel, Model 2.
 4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
 5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
 6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
 7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
1. Design: Flush panel.
 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.
 - a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
 3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
 4. Vertical Edges: Vertical edges to have the face sheets spot welded and filled full height with an epoxy filler. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
 5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet.
 6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
 7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- D. Manufacturers Basis of Design:

1. Curries Company (CU) - Polystyrene Core - 707 Series.
2. Curries Company (CU) - Energy Efficient - 777 Trio-E Series.

2.4 HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames. Tested for thermal performance in accordance with NFRC 102, and resistance to air infiltration in accordance with NFRC 400. Where indicated provide thermally broken frame profiles available for use in both masonry and drywall construction. Fabricate with 1/16" positive thermal break and integral vinyl weatherstripping.
- C. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.
 1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
 2. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
 3. Manufacturers Basis of Design:
 - a. Curries Company (CU) – Thermal Break TQ Series.
- D. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
 1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
 2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
 3. Manufacturers Basis of Design:
 - a. Curries Company (CU) - M Series.
- E. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
- F. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.

- 3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.
- B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.
- C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.6 LOUVERS

- A. Metal Louvers: Unless otherwise indicated provide louvers to meet the following requirements.
 - 1. Blade Type: Vision proof inverted V or inverted Y.
 - 2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.
- B. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.
 - 1. Manufacturers: Subject to compliance with requirements, provide louvers to meet rating indicated.
 - 2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

2.7 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.8 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 thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.
- C. Hollow Metal Doors:

1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
2. Louvers: Factory cut openings in door and install louvers into prepared openings where indicated.
3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

D. Hollow Metal Frames:

1. Shipping Limitations: 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.
2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
5. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
6. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
7. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
8. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry 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) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

- b. 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.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
 - 9. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
 - 10. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.
- E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
- 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - 2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
 - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 - 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.9 STEEL FINISHES

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

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. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. 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. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.
- E. Verify tolerances against manufacturers installations instructions for tornado and hurricane storm shelter openings.

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 ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
 - 1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.

4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

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 and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.5 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

Wolfe's Neck Woods State
Park
Freeport, Maine

SECTION 081113
HOLLOW METAL DOORS
AND FRAMES

END OF SECTION 081113

SECTION 085200 - WOOD WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fiberglass-clad wood windows.

1.2 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.

B. Shop Drawings:

1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, window rough openings, and details of installation, including anchor, flashing, and sealant installation.

C. Samples for Initial Selection: For units with factory-applied finishes, manufacturer's standard color sheets, showing full range of available colors for each type of exposed finish.

1. Include Samples of hardware and accessories involving color selection.

D. Product Schedule: For wood windows. Use same designations indicated on Drawings.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating hinged wood-framed glass doors that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.

B. Installer Qualifications: Authorized representative who is trained and approved by manufacturer.

C. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in state where Project is located and who is experienced in providing engineering services of the type indicated.

D. Testing Agency Qualifications: WDMA-accredited testing agency for testing indicated.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wood windows to Project site in original, unopened packages and store them in accordance with manufacturer's written instructions. Protect wood windows against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Handle wood windows in a manner that prevents damage before, during, and after installation.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Do not install wood windows outside of limits recommended in writing by manufacturer.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace wood 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: Five years from date of Substantial Completion.
 - b. Glazing Units: Five years from date of Substantial Completion.
 - c. Hardware: Three years from date of Substantial Completion.
 - d. Fiberglass Cladding: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WOOD WINDOWS, GENERAL

- A. Provide manufacturer's standard wood window assemblies consisting of frames, sashes, glass, hardware, fasteners, and all components and accessories as required for a complete installation.

2.2 FIBERGLASS-CLAD WOOD WINDOWS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Andersen Windows, Inc.; Andersen Corporation
- B. Operating Types: Provide the following operating types in locations indicated on Drawings:
 - 1. Double hung.
 - 2. Horizontal sliding.
- C. Exterior Surfaces: Manufacturer's standard fiberglass-clad frame.
 - 1. Color: Black.
- D. Interior Surfaces: Pine.
 - 1. Visible Finger Joints: Allowed.
 - 2. Finish: Unfinished.

2.3 WINDOW COMPONENTS

- A. Frames and Sashes: Fine-grained wood lumber complying with AAMA/WDMA/CSA 101/I.S.2/A440; kiln dried to a moisture content of not more than 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than **1/32 inch** deep by **2 inches** wide; water-repellent preservative treated.

2.4 GLASS AND GLAZING

- A. Glass: Clear annealed glass, ASTM C1036, Type 1, Class 1, q3.
 - 1. Kind: Fully tempered where indicated on Drawings.
- B. Insulating-Glass Units: ASTM E2190.
 - 1. Glass: ASTM C1036, Type 1, Class 1, q3.
 - a. Tint: Clear.
 - b. Kind: Fully tempered where indicated on Drawings.
 - 2. Filling: Fill space between glass lites with air.
 - 3. Low-E Coating: Pyrolytic on second surface.

2.5 HARDWARE

- A. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
 - 1. Exposed Hardware Color and Finish: Black.
- B. Hung Window Hardware:
 - 1. Counterbalancing Mechanism: Complying with AAMA 902, concealed, of size and capacity to hold sash stationary at any open position.
 - 2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only. Provide custodial locks.
 - 3. Tilt Hardware: Releasing tilt latch allows sash to pivot about horizontal axis to facilitate cleaning exterior surfaces from the interior.
- C. 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.
- D. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- E. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
 - 1. Exposed Fasteners: Avoid exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.6 INSECT SCREENS

- A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.
 - 1. Type and Location: Full, outside for double-hung Full, outside for sliding sashes.
- B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.

1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.
 2. Finish for Exterior Screens: Black.
- C. Aluminum Wire Fabric: **18-by-16** mesh of **0.011-inch** diameter, coated aluminum wire.
1. Wire-Fabric Finish: Natural bright.

2.7 FABRICATION

- A. Fabricate wood windows in sizes indicated. Include a complete system for installing and anchoring windows.
- B. Glaze wood windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF WOOD WINDOWS

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E2112.
- B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Mullions: Install combination and reinforcing mullions for combination assemblies in

accordance with manufacturer's written instructions.

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 using manufacturer's written instructions. 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 in accordance with manufacturer's written instructions.

END OF SECTION 085200

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Sliding doors.
 - 3. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section "Hollow Metal Doors and Frames".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
 - 1. ANSI/BHMA Certified Product Standards - A156 Series.
 - 2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
 - 3. ANSI/UL 294 - Access Control System Units.
 - 4. UL 305 - Panic Hardware.
 - 5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 - 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- D. Informational Submittals:
 - 1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
- F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.

- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 - 3. Review sequence of operation narratives for each unique access controlled opening.
 - 4. Review and finalize construction schedule and verify availability of materials.
 - 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified

electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 BUTT HINGES

- A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
 4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
 5. Manufacturers:
 - a. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.3 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.
1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
 2. Furnish dust proof strikes for bottom bolts.
 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.

4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:
 - a. Rockwood (RO).

2.4 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
 1. Threaded mortise cylinders with rings and cams to suit hardware application.
 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
 4. Tubular deadlocks and other auxiliary locks.
 5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 6. Keyway: Match Facility Standard.
- C. Large Format Interchangeable Cores: Provide removable cores (LFIC) as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.
- D. Keying System: Each type of lock and cylinders to be factory keyed.
 1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 3. Existing System: Field verify and key cylinders to match Owner's existing system.
- E. Key Quantity: Provide the following minimum number of keys:
 1. Change Keys per Cylinder: Two (2)
 2. Master Keys (per Master Key Level/Group): Five (5).
 3. Construction Control Keys (where required): Two (2).
 4. Permanent Control Keys (where required): Two (2).
- F. Construction Keying: Provide temporary keyed construction cores.
- G. Key Registration List (Bitting List):
 1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.

2. Provide transcript list in writing or electronic file as directed by the Owner.

2.5 MORTISE LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ML2000 Series.

2.6 DEADLOCKS AND LATCHES

- A. Mortise Deadlocks, Small Case: ANSI/BHMA A156.36, Grade 1, small case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. Steel or stainless steel bolts with a 1" throw and hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other specified locksets.

1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - DL4000 Series.

2.7 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

- B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.8 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
 4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Commercial Duty): ANSI/BHMA 156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, institutional grade door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck, closing sweep, and latch speed control valves. Provide non-handed units standard.
1. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - DC6000 Series.

2.9 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:

- a. Stainless Steel: 300 grade, 050-inch thick.
- 5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
- 6. Manufacturers:
 - a. Rockwood (RO).

2.10 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 - 1. Manufacturers:
 - a. Rockwood (RO).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
 - 1. Manufacturers:
 - a. Norton Rixson (RF).

2.11 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
 - 1. Pemko (PE).

2.12 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.13 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed,

operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

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.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
 1. Quantities listed are for each pair of doors, or for each single door.
 2. The supplier is responsible for handing and sizing all products.
 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Refer to Section 080671, Door Hardware Sets, for hardware sets.

END OF SECTION 087100

SECTION 089119 - FIXED LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fixed extruded-aluminum and formed-metal louvers.
2. Fixed formed-metal acoustical louvers.
3. Blank-off panels for louvers

B. Related Requirements:

1. Section 081113 "Hollow Metal Doors and Frames" for louvers in hollow-metal doors.
2. Section 081416 "Flush Wood Doors" for louvers in flush wood doors.
3. Section 099113 "Exterior Painting" for field painting exterior louvers.
4. Section 099123 "Interior Painting" for field painting interior louvers.

1.2 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades (i.e., the axis of the blades are horizontal).
- C. Vertical Louver: Louver with vertical blades (i.e., the axis of the blades are vertical).
- D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.
- E. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven-rain performance, as determined by testing in accordance with AMCA 500-L.
- F. Windborne-Debris-Impact-Resistant Louver: Louver that provides specified windborne-debris-impact resistance, as determined by testing in accordance with AMCA 540.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing

specified models with appropriate AMCA Certified Ratings Seals.

- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
 - 1. Show weep paths, gaskets, flashings, sealants, and other means of preventing water intrusion.
 - 2. Show mullion profiles and locations.
- C. Samples: For each type of metal finish required.

1.4 WARRANTY

- A. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of baked enamel, powder coat, or organic finishes within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: Five years from date of Substantial Completion.
- B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, peeling, or chipping.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIXED EXTRUDED-ALUMINUM LOUVERS

- A. Vertical, Wind-Driven-Rain-Resistant, Windborne-Debris-Impact-Resistant Louver,

Extruded Aluminum:

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. Airolite Company, LLC (The)
 - b. Greenheck Fan Corporation

2.2 MATERIALS

- A. Aluminum Extrusions: **ASTM B221**, Alloy 6063-T5, T-52, or T6.
- B. Aluminum Sheet: **ASTM B209**, Alloy 3003 or 5005, with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Fasteners: Use types and sizes to suit unit installation conditions.
 1. Use hex-head or Phillips pan-head screws for exposed fasteners unless otherwise indicated.
 2. For fastening aluminum, use aluminum or 300 series stainless steel fasteners.
 3. For fastening galvanized steel, use hot-dip-galvanized-steel or 300 series stainless steel fasteners.
 4. For fastening stainless steel, use 300 series stainless steel fasteners.
 5. For color-finished louvers, use fasteners with heads that match color of louvers.
- D. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, fabricated from stainless steel components, with allowable load or strength design capacities calculated in accordance with ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing in accordance with ASTM E488/E488M conducted by a qualified testing agency.

2.3 FABRICATION

- A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
- D. Include supports, anchorages, and accessories required for complete assembly.
- E. Provide subsills made of same material as louvers for recessed louvers.

- F. Join frame members to each other and to fixed louver blades with fillet welds concealed from view unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.4 GALVANIZED-STEEL SHEET FINISHES

- A. Finish louvers after assembly.
- B. Surface Preparation: Clean surfaces with nonpetroleum solvent, so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and repair in accordance with ASTM A780/A780M.
- C. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of **2 mils**.
 - 1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and openings, 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. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers,

as indicated.

- E. Protect unpainted galvanized- and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

- A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers damaged during installation and construction, so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
 - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089119

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Primers.
2. Finish coatings.
3. Floor sealers and paints.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for shop priming metal fabrications.
2. Section 099300 "Staining and Transparent Finishing" for surface preparation and application of wood stains and transparent finishes on exterior wood substrates.
3. Section 099600 "High-Performance Coatings" for tilelike coatings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include preparation requirements and application instructions.
2. Indicate VOC content.

B. Sustainable Design Submittals:

1. Third-Party Certified Life-Cycle Assessment: For each product.

C. Samples: For each type of topcoat product.

D. Samples for Initial Selection: For each type of topcoat product.

E. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Submit Samples on rigid backing, **8 inches** square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

F. Product Schedule: Use same designations indicated on Drawings and in the exterior painting schedules to cross-reference paint systems specified in this Section. Include color designations.

1.3 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least **100 sq. ft.**
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.4 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.

1.5 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between **50 and 95 deg F**.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than **5 deg F** above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 PRIMERS

- A. Epoxy Metal Primer: Corrosion-resistant, solvent-based, two-component epoxy primer formulated for use on prepared, exterior ferrous- and galvanized-metal surfaces.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:

- a. Benjamin Moore & Co.

2.2 FINISH COATINGS

- A. High-Build Epoxy Paint, Low Gloss: High-solids, two-component epoxy; formulated for use on exterior concrete, masonry, and primed-metal surfaces.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Benjamin Moore & Co.
 2. Gloss and Sheen Level: Manufacturer's standard low-gloss finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Concrete: 12 percent.
 2. Masonry (Clay and Concrete Masonry Units): 12 percent.
 3. Wood: 15 percent.
 4. Portland Cement Plaster: 12 percent.
- C. Portland Cement Plaster Substrates: Verify that plaster is fully cured.
- D. Verify suitability of substrates, including surface conditions and compatibility, with finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of

size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems specified in this Section.
- 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. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- G. Wood Substrates:
1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
 2. Sand surfaces that will be exposed to view, and remove sanding dust.
 3. Prime edges, ends, faces, undersides, and backsides of wood.
 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- H. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 INSTALLATION

- A. Apply paints in accordance with manufacturer's written instructions.
1. Use applicators and techniques suited for paint and substrate indicated.
 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 4. Paint entire exposed surface of window frames and sashes.
 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

6. Primers specified in the exterior painting schedules may be omitted on items that are factory primed or factory finished if compatible with intermediate and topcoat coatings and acceptable to intermediate and topcoat paint manufacturers.
- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 EXTERIOR PAINTING SCHEDULE, METAL SUBSTRATES

- A. Steel and Iron Substrates:
 1. Water-Based, Light Industrial Coating over Epoxy System A-3.1:
 - a. Prime Coat: Epoxy metal primer.
 - b. Intermediate Coat: High-build epoxy paint, low gloss.
 - c. Topcoat: Exterior, water-based, light industrial coating, low sheen.

3.5 EXTERIOR PAINTING SCHEDULE, WOOD SUBSTRATES

- A. Dressed-Lumber Substrates: Trim Board siding.
 1. Latex over Latex Primer System :
 - a. Prime Coat: Exterior, latex wood primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, low sheen.

3.6 EXTERIOR PAINTING SCHEDULE, MISCELLANEOUS SUBSTRATES

- A. Plastic-Trim-Fabrication Substrates:
 1. Latex System A-3.1:
 - a. Prime Coat: Water-based bonding primer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Exterior latex paint, low sheen.

END OF SECTION 099113

SECTION 099300 - STAINING AND TRANSPARENT FINISHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood stains.

B. Related Requirements:

1. Section 099123 "Interior Painting" for stains and transparent finishes on concrete floors.
2. Section 099600 "High-Performance Coatings" for transparent high-performance coatings on concrete floors and clay masonry.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.
2. Include preparation requirements and application instructions.
3. Indicate VOC content.

B. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of exposed finish.

C. Samples for Verification: Sample for each type of finish system and in each color and gloss of finish required on representative samples of actual wood substrates.

1. Size: **8 inches** square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

E. Sustainable Design Submittals:

1. Third-Party Certifications: For each product.
2. Third-Party Certified Life Cycle Assessment: For each product.

1.3 MOCKUPS

- A. Apply mockups of each finish system indicated and each color selected to demonstrate aesthetic effects.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each type of finish system and substrate.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least **10 sq. ft.**
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of stain color selections will be based on mockups.
 - a. If preliminary stain color selections are not approved, apply additional mockups of additional stain colors selected by Architect at no added cost to Owner.

1.4 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.

1.5 FIELD CONDITIONS

- A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between **50 and 95 deg F**.
- B. Do not apply finishes when relative humidity exceeds 85 percent, at temperatures of less than **5 deg F** above the dew point, or to damp or wet surfaces.
- C. Do not apply exterior finishes in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Source Limitations: Obtain each coating product from single source from single manufacturer.

2.2 WOOD STAINS

- A. Stain, Exterior, Water Based, Solid Hide: Water-based, solid-hide, emulsion-type, pigmented stain for primed or previously painted exterior wood surfaces.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Benjamin Moore & Co.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Exterior Wood Substrates: 15 percent, when measured with an electronic moisture meter.
- C. Maximum Moisture Content of Interior Wood Substrates: 10 percent, when measured with an electronic moisture meter.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with finish application only after unsatisfactory conditions have been corrected.
 1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
 1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- B. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each substrate condition and as specified.
 1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
 2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.
- C. Exterior Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Prime edges, ends, faces, undersides, and backsides of wood.
 - a. For solid hide stained wood, stain edges and ends after priming.
 - b. For varnish-coated stained wood, stain edges and ends and prime with varnish. Prime undersides and backsides with varnish.
3. Countersink steel nails, if used, and fill with putty or plastic wood filler tinted to final color. Sand smooth when dried.

3.3 APPLICATION

- A. Apply finishes according to manufacturer's written instructions.
 1. Use applicators and techniques suited for finish and substrate indicated.
 2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
 3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from finish application. Correct damage 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 finished wood surfaces.

3.5 EXTERIOR WOOD-FINISH-SYSTEM SCHEDULE

- A. Wood Substrates, Wood Trim:
 1. Solid-Color, Water-Based Stain System A-2.1:
 - a. Prime Coat: Primer, alkyd for exterior wood.
 - b. Intermediate Coat: Stain, exterior, water based, solid hide, matching topcoat.

- c. Topcoat: Stain, exterior, water based, solid hide.

3.6 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

A. Wood Substrates, Wood Trim Wood Board Paneling:

1. Water-Based Sealer - Seal-Once NANO

- a. First coat: Apply Seal-Once NANO to both sides of the pine boards prior to installing
- b. Second Coat: Apply Seal-Once NANO to the exposed face after installed

END OF SECTION 099300

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.

B. Related Requirements:

1. Section 088300 "Mirrors" for frameless mirrors.
2. Section 093013 "Ceramic Tiling" for ceramic toilet and bath accessories.
3. Section 102813.63 "Detention Toilet Accessories" for accessories designed for installation in detention facilities.

1.2 ALLOWANCES

- A. See Section 012100 "Allowances" for description of allowances affecting items specified in this Section.

1.3 UNIT PRICES

- A. See Section 012200 "Unit Prices" for description of unit prices affecting items specified in this Section.

1.4 ALTERNATES

- A. See Section 012300 "Alternates" for description of alternates affecting items specified in this Section.

1.5 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.

1.6 ACTION SUBMITTALS

- A. Product Data: For each product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Include electrical characteristics.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
- C. Delegated Design Submittals: For grab bars.
 - 1. Include structural design calculations indicating compliance with specified structural-performance requirements.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

1.8 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, visible silver spoilage defects.
 - 2. Warranty Period: 5 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Hand Dryers: Manufacturer agrees to repair or replace hand dryers that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Structural Performance: Design accessories and fasteners to comply with the following

requirements:

1. Grab Bars: Installed units are able to resist **250 lbf** concentrated load applied in any direction and at any point.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Toilet Tissue (Roll) Dispenser:

1. Basis-of-Design Product: Subject to compliance with requirements, provide ASI - 20030 or comparable product by one of the following:
 - a. ASI-American Specialties, Inc.
 - b. ASI-American Specialties, Inc.: 20030 Roval™ Twin Hide-A-Roll Toilet Tissue Dispenser
2. Description: Roll-in-reserve dispenser with hinged front secured with tumbler lockset.
3. Mounting: Surface mounted.
4. Capacity: Designed for **4-1/2- or 5-inch-** diameter tissue rolls.
5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

B. High-Speed Air Hand Dryer:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Excel Dryer Inc.: XLERATOReco® Hand Dryer
2. Basis-of-Design Product: Subject to compliance with requirements, provide XLERATOR - XL-SB or comparable product by one of the following:
 - a. Excel Dryer Inc.: XLERATOReco® Hand Dryer
3. Description: High-speed, unheated-air hand dryer for rapid hand drying.
4. Mounting: Surface mounted.
5. Operation: Infrared-sensor activated with timed power cutoff switch.
 - a. Average Dry Time: 12 seconds.
 - b. Automatic Shutoff: At 60 seconds.
6. Maximum Sound Level: 69 dB.
7. Cover Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
8. Electrical Requirements: 115 V, 13 A, 1500 W 115 V, 20 A, 2300 W.

C. Soap Dispenser:

1. Basis-of-Design Product: Subject to compliance with requirements, provide ASI-American Specialties, Inc. - Surface Mounted Vertical Liquid Soap Dispenser -

0347 or comparable product by one of the following:

- a. ASI-American Specialties, Inc.
 2. Description: Designed for manual operation and dispensing soap in liquid or lotion form.
 3. Mounting: Vertically oriented, surface mounted.
 4. Capacity: 40 fl oz minimum.
 5. Materials: Stainless Steel.
 6. Lockset: Tumbler type.
 7. Refill Indicator: Window type.
- D. Grab Bar:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Insert manufacturer's name; product name or designation or comparable product by one of the following:
 - a. ASI-American Specialties, Inc.
 2. Mounting: Flanges with concealed fasteners.
 3. Material: Stainless steel, **0.05 inch** thick.
 - a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin) on ends and slip-resistant texture in grip area.
 4. OD: **1-1/4 inches**.
 5. Configuration and Length: As indicated on Drawings.
- E. Mirror Unit:
1. Basis-of-Design Product: Subject to compliance with requirements, provide ASI-American Specialties, Inc.: 0600 Series Stainless Steel Inter-Lok Angle Frame Mirror or comparable product by one of the following:
 - a. ASI-American Specialties, Inc.
 2. Frame: Stainless steel, fixed tilt.
 - a. Corners: Welded and ground smooth.
 3. Size: 24 inches wide x 36 inches tall.
 4. Hangers: Manufacturer's standard rigid, tamper and theft resistant.
- F. Fixed-Height Adult Changing Station:
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. Foundations Worldwide, Inc.

2. Description: Horizontal unit that opens by folding down from stored position and with adjustable strap.
 - a. Engineered to support minimum of 350 lb static load when opened.
3. Mounting: Surface mounted, with unit projecting not more than 4 inches from wall when closed.
4. Operation: By pneumatic shock-absorbing mechanism.
5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin), with replaceable insulated polystyrene tray liner and rounded plastic corners.
6. Liner Dispenser: Provide built-in dispenser for disposable sanitary liners.

2.3 MATERIALS

- A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.031-inch- minimum nominal thickness unless otherwise indicated.
- B. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.
- C. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.4 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 OF TOILET, BATH, AND LAUNDRY ACCESSORIES

- A. Install accessories in accordance with 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.
 1. Remove temporary labels and protective coatings.
- B. Grab Bars: Install to comply with specified structural-performance requirements.
- C. Shower Seats: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Clean and polish exposed surfaces in accordance with manufacturer's written instructions.

END OF SECTION 102800

SECTION 220000 – PLUMBING

PART 1 - GENERAL

1.1 GENERAL REFERENCES

- A. All the Contract Documents and General Provisions of the Contract including, but not limited to, General and Supplementary Conditions, and Division 1 Specification Sections apply to this Section.
- B. The work of this Section provides and contains general information which is inherently made a part of each Section and applies to all work performed under this Contract.
- C. The Drawings on which this Contract is based are listed in Division 1. Consult all Drawings, note all conditions that may affect the Work and care for same in executing the Contract.

1.2 SCOPE OF WORK

- A. Provide all labor, materials, equipment, services and accessories necessary to furnish and install the work of this Section, complete and functional, as indicated in the Contract Documents and as specified herein.
- B. The work covered by this Section of the Specifications includes the furnishing of all labor and materials and in performing all operations in connection with the installation of the Plumbing Work.
- C. Without limiting the generality thereof, the work to be performed under this Section includes:
 - 1. Complete Sanitary, Waste & Vent Systems to below slab and/or as shown on the drawings.
 - 2. Cold, Hot, and Hot Water Re-circulation System.
 - 3. Insulation and identification.
 - 4. Domestic Water Heating Equipment.
 - 5. Fixtures and accessories.
 - 6. Connection to Equipment Furnished by Others. Coordinate well equipment end point connection for plumbing distribution.
 - 7. Flushing, Sterilization, and Tests
 - 8. Furnishing of Access Panels
 - 9. Drilling, Coring and Cutting & Patching of holes and openings where the largest dimension thereof does not exceed 16 inches for Plumbing Piping
 - 10. and Equipment.
 - 12. Scaffolding, Rigging, and Staging required for all Plumbing Work.
 - 13. Comply with Division 1 requirements.
 - 14. Smoke and Firestopping Seals and sealing of all wall penetrations as detailed on architectural drawings. Refer to Section 078400 which defines the firestopping

materials and methods.

15. When open-flame or spark producing tools such as blow torches, welding equipment, and the like are required in the process of executing the work, the General Contractor shall be notified not less than twenty four hours in advance of the time that the work is to begin and the location where work is to be performed. Provide fire protective covering and maintain constant non-working fire watch, paying all fees, where work is being performed and until it is completed. Fee for fire watch shall be included in the bid.
16. Coordinate and verify existing well supply and septic systems capacity with the site Contractor. Information is not available and was not provide to the design Team during the design phase and it was assumed the capacity available is sufficient for the new building and associated plumbing fixtures and equipment.

1.3 RELATED WORK

- A. The following Related Work will be performed under the designated Sections:
- B. Electric Power Wiring: DIVISION 26 - ELECTRICAL
- C. Excavation and Backfill: DIVISION 31 – EARTHWORK

1.4 CODES, ORDINANCES, AND PERMITS

- A. Perform all work in accordance with the requirements of the Building Department, State Plumbing and Fuel Gas Codes, D.E.P., A.D.A., NFPA, The Energy Code and any applicable State and Federal Laws. Give all requisite notices, file all requisite plans, and obtain all permits required to perform all Plumbing Work. Where the Contract Documents indicate more stringent requirements than the above Codes and Ordinances, the Contract Documents shall take precedence.
- B. Obtain all permits, inspections, and approvals, from the governing authorities and pay all fees and include cost in the bid.

1.5 DISCREPANCIES IN DOCUMENTS

- A. Where Drawings or Specifications conflict or are unclear, advise Designer in writing before Award of Contract. Otherwise, Designer's interpretation of Contract Documents shall be final, and no additional compensation shall be permitted due to discrepancies or unclarities thus resolved.
- B. Where Drawings or Specifications do not coincide with manufacturers' recommendations, or with applicable codes and standards, alert Designer in writing before installation. Otherwise, make changes in installed work as Designer requires within Contract Price.
- C. If the required material, installation, or work can be interpreted differently from drawing to drawing, or between drawings and specs, this contractor shall provide that material, installation, or work which is of the higher standard.

- D. It is the intent of these contract documents to have the contractor provide systems and components that are fully complete and operational and fully suitable for the intended use. There may be situations in the documents where insufficient information exists to precisely describe a certain component or subsystem, or the routing of a component. In cases such as this, where the contractor has failed to notify the Designer of the situation in accordance with the paragraph above, the contractor shall provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in workmanlike manner either concealed or exposed per the design intent.
- E. In cases covered by the paragraph above, where the contractor believes he needs engineering guidance, he shall submit a sketch identifying his proposed solution and the Designer shall review, note if necessary, and approve the sketch.

1.6 MODIFICATIONS IN LAYOUT

- A. Plumbing Drawings are diagrammatic. They do not indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet architectural requirements.
- B. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Designer.
- C. Check Contract Drawings as well as Shop Drawings of all subcontractors to verify and coordinate spaces in which work of this Section will be installed.
- D. Maintain maximum headroom at all locations. All piping and associated components to be as tight to underside of structure as possible.
- E. Make reasonable modifications in layout and components needed to prevent conflict with work of other trades and to coordinate according to Paragraphs A, B, C, D above. Systems shall be run in a rectilinear fashion.
- F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Designer for review and approval.

1.7 SHOP DRAWING AND MATERIAL SCHEDULES

- A. Refer to SECTION 012500 - SUBMITTALS for submittal of Shop Drawings. If apparatus or materials are substituted for those specified, and such substitution necessitates changes in or additional connections, piping, supports or construction, same shall be provided as the responsibility, and at the expense, of the Plumbing Subcontractor.
- B. Fabrication of any material or performing of any work prior to the final approval of the Submittals will be entirely at the risk of the Subcontractor. The Subcontractor is responsible for furnishing and installing materials called for in the Contract Documents,

even though these materials may have been omitted from approved Submittals.

C. Submit Shop Drawings for the following materials and equipment.

1. Valves, Piping, couplings and Fittings
2. Fixtures, Drains and Equipment including Supports
3. Access Panels and Covers
4. Insulation and identification
5. Drains, plumbing Specialties
6. Hose Bibs
7. Piping Hangers, Anchors, Guides, and Supports
8. Cleanouts

1.8 RECORD DRAWINGS

- A. General: Refer to DIVISION 01 - GENERAL REQUIREMENTS for general requirements for maintaining as-built drawings and submitting final reproducible record documents.
- B. The General Contractor will provide two sets of Drawings to the Plumbing Subcontractor, one set of which shall be maintained at the site and which shall, at all times, be accurate, clear, and complete, showing the actual locations of all equipment and piping as it is being installed. The Record Drawings shall be available to the Architect/Engineer's field representative at all times.
- C. Provide electronic AutoCAD drawings to indicate revisions to piping size and location both exterior and interior; including locations of valves and other equipment requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; concealed equipment, dimensioned to column line; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located.
- D. Include in the Record Drawings any addenda, sketches, and supplementary Drawings issued during the course of construction.
- E. Non-availability of Record Drawings or inaccuracies therein will postpone the final inspection until they are available.
- F. All valves shown on these Drawings shall be numbered with numbers corresponding to those on the valve charts.
- G. All costs related to the foregoing requirements shall be paid by the Plumbing Subcontractor.

1.9 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS

- A. Provide operating instructions to the Owner's designated representative with respect to operation functions and maintenance procedures for all equipment and systems installed. At the completion of the project, turn over to the Architect four (4) complete

manuals, in three-ring, loose-leaf binders, containing the following:

1. Complete Shop Drawings of all equipment.
2. Operation description for all systems.
3. Names, addresses, and telephone numbers of all suppliers of the system.
4. Preventative maintenance instructions for all systems.
5. Spare parts lists of all system components.
6. Valve tag chart.

1.10 GUARANTEE

- A. Refer to Division 1 of the Contract. Guarantee all work under this Section free from defects in workmanship and materials for a period of one (1) year from the date of final acceptance of the building, as set forth in the Contract. Replace any such defective work developing during this period, unless such defects are clearly the result of bad usage of equipment by others. Where such defective work results in damage to work of other Sections of the Specifications, restore such work to its original condition by mechanics skilled in the affected trade.

1.11 DRAWINGS

- A. All work shown on the Drawings is intended to be approximately correct to scale, but shall be taken in a sense as diagrammatic. Sizes of pipes and general method of running them are shown, but it is not intended to show every offset and fitting. To carry out the true intent and purpose of the plans, furnish all necessary parts to make complete working systems ready for use. The Plumbing Drawings are intended to show the main stacks and risers and may or may not necessarily show all runout piping particularly in lavatories and gang toilet areas. Contractor shall include all runout piping to all referenced scheduled fixtures and equipment appearing on the Plumbing Drawings.
- B. The Plumbing Drawings and Specifications are intended to supplement each other so that any details shown on the Drawings and not mentioned in the Specifications, or vice-versa, shall be executed the same as if mentioned in the Specifications and shown on the Drawings.
- C. Refer to the Architectural, Structural, and other Mechanical and Electrical Drawings, which indicate the construction in which this Work shall be installed. Locations shown on the plans shall be checked against the general and detailed Drawings of the construction proper. All measurements shall be taken at the Building.

1.12 VALVE TAGS, NAMEPLATES, AND CHARTS

- A. All valves on pipes of every description shall have neat circular brass valve tags at least 1-1/2 in. in diameter attached with brass hook to each valve stem. Stamp on these valve tags, in letters as large as practical, the number of the valve and the service, such as "HW, CW, HWR", for hot water, cold water, and respectively. The numbers for each service shall be consecutive. Where valves are located above ACT

ceilings, furnish and install valve finder ceiling tack, tack shall be minimum 7/8 in. diameter with 1/2 in. steel point, color as determined by Owner.

- B. All valves on tanks and pumps shall be numbered by 3 in. red metal discs with white numbers 2 in. high, secured to stem of valves by means of small solid link brass chain, to correspond to numbers indicated for valves on the Record Drawings and on two (2) printed detailed lists. These printed lists shall state the numbers and locations of each valve and the fixture or group of fixtures which it controls, and other necessary information such as requiring the opening or closing of another valve or valves when any one valve is to be opened and closed, and shall be prepared in form to meet approval of the Architect, and shall be framed under glass.
- C. Nameplates, catalog numbers, and rating identifications shall be securely attached to Electrical and Mechanical equipment with screws or rivets. Adhesives or cements will not be permitted.

1.13 PIPE MARKER IDENTIFICATION SYSTEM

Mark all piping installed under this Section and at all Access Panels with a marking system in basic colors conforming to those specified in ANSI/ASME A13.1. Markings shall indicate pipe content and direction of flow. Markers shall be applied at all valves and tee joints, and on straight runs of pipe at every 20 ft.-0in. on center. Adhesive markings are not acceptable. Markers shall be painted on under the scope of this Section or may be snap-on system.

- A. Clearly mark Domestic water system with 4 inch wide colored bands, with arrow for direction of flow, every twenty-five (25) feet on center on all piping installed whether it is concealed or exposed and also on both sides of floor and/or wall penetrations. Mark potable water green and non-potable yellow. Within 6 in. of each band identify with letter "Potable C.W.", Non-Potable H.W." Color of letter shall match banding.

1.14 SANITARY, WASTE, VENT, SYSTEMS

- A. Furnish and install complete Sanitary, Waste, Vent, Systems (all hereinafter called Drainage Systems) to convey wastes from all Soil and Waste Stacks, Fixtures, and Equipment, as indicated and/or described in these Plans and Specifications. Waste piping smaller than 2 in. shall not be used underground. The use of double "Y"s in the horizontal shall not be permitted. All piping shall be installed straight and true and located concealed within building construction.
- B. All horizontal Drainage Systems Piping within the building, 3 in. and smaller, shall be pitched at least 1/4 in. per ft. in the direction of flow. Drainage Piping 4 in. and larger shall be pitched at least 1/8 in. per ft. Make changes in direction of drainage lines with 45 wyes, long turn wyes, or sweep bends. Piping shall be run as indicated on the Drawings, properly secured to the building structure with iron hangers. When any end circuit vent pipe from any fixture or line of fixtures is connected to a vent line serving other fixtures, the connection shall be sufficiently more above the floor on which the fixtures are located to prevent the use of the vent line as a waste (6 in. above flood rim of fixture).

- C. Furnish and install all cleanouts indicated on the Drawings and/or where required in Drainage Pipes regardless of size so that the distance between cleanouts does not exceed 45 ft. o.c. Cleanouts shall be installed at the base of all risers and at each change of direction.

1.15 DOMESTIC WATER SYSTEMS

- A. Furnish, install, sterilize, and test in accordance with the documents and the Plumbing Code, complete potable and non-potable Domestic Cold, Hot, and Hot Water Recirculating Systems including all piping, valves, low point drains, shock absorbers, hangers, insulation, backflow preventers and water heating equipment. Clearly mark the systems as provided above. This work shall start as indicated on the Drawings.
- B. In general, piping shall pitch upward in the direction of flow with each branch and riser separately valved and with 1/2 in. hose end drain on the outlet side of the valve and at all low points in the system. Install shutoff valves for each battery of fixtures and other valves as necessary to isolate and winterize any part of each system.
- C. Furnish and install a ball valve, balancing valve and check valve at each hot water recirculation line before it connects to another hot water recirculation line.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials and equipment furnished under this SECTION shall be new, unused, first quality of a manufacturer of established reputation. Each valve, fitting, section of pipe, and piece of equipment supplied to project shall have cast or indelibly stamped thereon the manufacturer's name, pressure rating where applicable, type, and any other specific information provided by manufacturer.

2.2 PIPING MATERIALS

A. HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- 1. Pipe and Fittings: ASTM A 74, Service class.
- 2. Gaskets: ASTM C 564, rubber.

B. HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- 1. Pipe and Fittings: ASTM A 888 or CISPI 301.
- 2. CISPI, Hubless-Piping Couplings:
- 3. Manufacturers:
 - a. ANACO-Husky.
 - b. Mission Rubber Company; a division of MCP Industries, Inc.
 - c. Tyler Pipe.

4. Standards: ASTM C 1277 and CISPI 310.
5. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. DWV COPPER TUBE AND FITTINGS

1. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
2. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
3. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
4. Copper Pressure Fittings:
 - a. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
 - b. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
5. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
 - a. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - b. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
6. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

D. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
5. Copper Pressure-Seal-Joint Fittings:
 - a. Manufacturers: Subject to compliance with requirements:
 - 1) Elkhart Products Corporation; Industrial Division.
 - 2) NIBCO INC.
 - 3) Viega; Plumbing and Heating Systems.
 - b. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.

E. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.

1. Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
2. Copper Pressure-Seal-Joint Fittings:
 - a. Manufacturers: Subject to compliance with requirements:
 - 1) Elkhart Products Corporation; Industrial Division.
 - 2) NIBCO INC.
 - 3) Viega; Plumbing and Heating Systems.
3. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.

2.3 VALVES

- A. Furnish and install valves where indicated on the Drawings or where specified and located so that they may be operated, repaired, or replaced with a minimum effort.
- B. The following list of valves is intended only as a guide for type and quality. Valves shall be as manufactured by Apollo, Milwaukee, Nibco, Elkhart, Watts or approved equal.
 1. Certifications: NSF/ANSI61, NSF/ANSI372
 2. Type: Ball Valve & Check Valve
 3. Connection Type: Press x Press; Press x Thread; Press x Hose; Solder x Solder
 4. Body Material: Brass/Bronze; SS ball
 5. Pressure Rating: 125SWP – 200 WOG
 6. Ball Material: Brass HCP
 7. Pin & Disc: SS; PTFE

2.4 INSULATION

- A. Insulation for all water piping whether concealed or exposed shall be 1 in. thick, heavy density, preformed snap-on insulation equal to Johns Manville Micro-Lok HP, 850 degrees snap-on system. Insulation for cold water piping shall have a factory applied vapor barrier with ends and butts sealed with overlapping 4".sealing strips.
- B. Valves, fittings, and the underside of roof drain bodies shall be insulated with pre formed fiberglass fitting insulation cut from dense fiberglass blanket and covered with pre-molded P.V.C. fitting covers. P.V.C. covers shall overlap the adjoining insulation and shall be secured with pressure sensitive vinyl tape over a vapor barrier adhesive seal at the joints. (Note: Staples or tacks are not permitted on covers).
- C. All insulation shall have self-sealing type, all service jacket (ASJ-SSL) factory applied. At all exposed piping, cover jacket with continuous P.V.C. jacket.
- D. Sealers, solvents, tapes, and adhesives, and mastics used in conjunction with the installation of insulation under this Section shall possess the maximum possible fire safe qualities available and shall be NFPA approved.
- E. Covering shall be applied over clean and dry surfaces. No covering shall be applied

until after the approval of all pressure and leakage tests.

- F. Insulation shall be as manufactured by Johns Manville, Inc., Owens-Corning Fiberglass Corporation SSL II-ASJ, or Knauf Insulation 1000. Insulation shall be applied by skilled insulation mechanics in a first class manner.

2.5 IDENTIFICATION

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches high.

2.6 PLUMBING FIXTURES

- A. Owner preferred plumbing fixtures shall be considered during the submittal process.
- B. WATER CLOSET (WC-1A)
 - 1. ASME A112.19.2, vitreous china, floor mounted wall outlet, elongated bowl, tank type, siphon-jet flushing action and white open front seat.
 - 2. ADA height
 - 3. Flush tank: 1.28gpf
 - 4. Color: White
 - 5. Accessories: Shut off valve, water supply, and wax drain kit
 - 6. Manufacturers:
 - a. American Standard
 - b. Kohler
 - c. Proflo
- C. LAVATORY (LAV-1A)
 - 1. ASME A112.19.2, vitreous china, wall-mounted, no backsplash, with wall carrier support and 4" center faucet holes.
 - 2. ADA height and clearance approach
 - 3. Sink Shroud

4. Faucet: Single Lever, metal body, ceramic disc valve, offset drain strainer, p-trap, shut-off valves, water supplies kit.
5. TMV: Thermostatic mixing valve, point of use to regulate water temperature delivery to 110F.
6. Color: White
7. Manufacturers:
 - a. American Standard
 - b. Kohler
 - c. Zurn
 - d. Delta
 - e. Symmons
 - f. Leonard

D. SERVICE SINK (MSB-1)

1. Service/Mop Sink: Floor mounted, molded stone sink with integral drain, 24" by 24" and shall have stainless steel wall guard, hose and bracket, mop bracket. Heavy duty, chrome plated dual handle sink faucet with pail hook and spout with ceramic cartridge and internal checks
2. Manufacturers:
 - a. Mustee
 - b. Zurn
 - c. Fiat

E. HOSE BIBB (HB-1)

1. Automatic draining freezeless wall hydrant with single check valve with vacuum breaker, and loose key operation.
2. Manufacturers:
 - a. Woodford
 - b. Zurn
 - c. Watts

F. WATER HEATER (EWH-1)

1. Hybrid electric Water Heater up to 4.0 UEF, Energy Star tank type water heater.
2. Capacity: 40 Gallon
3. Power: 240V/1Ph/5kW
4. Recovery: 27 gph @ 90F rise

G. FLOOR DRAIN (FD-1)

1. Adjustable floor drain with 2" bottom outlet, 6" Nickel Bronze, light duty heel proof strainer, vandal proof, trap priming tapping and sediment bucket.
2. Manufacturers:
 - a. J.R.Smith
 - b. Zurn

c. Watts

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

- A. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
 - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- B. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- C. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- D. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- E. Install shutoff valve, hose-end drain valve, pressure gage, and test tee with valve, inside the building at the water service entrance after the well bladder tank.
- F. Install shutoff valve immediately upstream of each dielectric fitting.
- G. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- H. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- I. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- J. Install piping adjacent to equipment and specialties to allow service and maintenance.
- K. Install piping to permit valve servicing.

- L. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.
- M. Install piping free of sags and bends.
- N. Install fittings for changes in direction and branch connections.
- O. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- P. Install thermometers on inlet and outlet piping from each water heater.
- Q. Install sleeves for piping penetrations of walls, ceilings, and floors.
- R. Install sleeve seals for piping penetrations of concrete walls and slabs.
- S. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
 - 3. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- D. Pressure-Sealed Joints: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.
- E. Copper-Tubing, Push-on Joints: Clean end of tube. Measure insertion depth with manufacturer's depth gage. Join copper tube and push-on-joint fittings by inserting tube to measured depth.
- F. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE INSTALLATION

- A. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball valves for piping NPS 2 and smaller.
- B. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping:
 - 1. Hose-End Drain Valves: At low points in water mains, risers, and branches.

3.5 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.6 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings.

3.7 HANGER AND SUPPORT INSTALLATION

- A. Support vertical piping and tubing at base and at each floor.
- B. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
- C. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
- D. Install supports for vertical copper tubing every 10 feet
- E. Install supports for vertical steel piping every 15 feet.

3.8 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.

- B. Install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 - 1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code.
 - 3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections.

3.9 IDENTIFICATION

- A. Identify system components.
- B. Label all piping with system identification and direction of flow.

3.10 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Piping Inspections:
 - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - c. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - d. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
 - e. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
 - f. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
 - 2. Piping Tests:
 - a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 - b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
 - c. Leave new, altered, extended, or replaced domestic water piping

- uncovered and unconcealed until it has been tested and approved.
Expose work that was covered or concealed before it was tested.
- d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - e. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
 - f. Prepare reports for tests and for corrective action required.
3. Domestic water piping will be considered defective if it does not pass tests and inspections.
 4. Prepare test and inspection reports.

3.11 ADJUSTING

- A. Perform the following adjustments before operation:
1. Close drain valves, hydrants, and hose bibbs.
 2. Open shutoff valves to fully open position.
 3. Open throttling valves to proper setting.
 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
 5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
 6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
 7. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.12 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - c. Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.

- d. Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
- e. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
- f. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

END OF SECTION 220000

SECTION 230000 – HEATING, VENTILATION, AND AIR CONDITIONING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Include the General Conditions of the Contract and Division 1, General Requirements, as part of this Section.
- B. Examine all other Sections of the Specifications for requirements that affect work under this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work of this Section with that of all other trades affecting, or affected by, this Section. Cooperate with such trades to ensure the steady progress of all work under the contract.

1.2 THIRD PARTY COMMISSIONING COORDINATION REQUIREMENTS

- A. Commissioning for HVAC system controls and equipment is to be performed by an independent commissioning agent.
- B. Contractor shall be responsible for coordination with the commissioning agent and Owner's representatives to assist in system commissioning and final functional testing for all equipment within project scope.
- C. Contractor to have a technician on-site as required to support commission scope.

1.3 SCOPE OF WORK

- A. Included in this Section is the furnishing of all labor, materials, equipment, and accessories required to provide a complete installation of the work described herein and on the Drawings. Build the work of other trades into the work of this Section as required.
- B. Give notices, file plans, obtain permits and licenses, pay fees and back charges and obtain necessary approvals from authorities having jurisdiction, as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda, all of which are part of Contract Documents.
- C. Base Bid Scope: Gatehouse Building
 - 1. Heat Pump Systems
 - 2. Controls

3. Submittals
4. Operations and Maintenance Manuals
5. Provide Close-Out procedures per Division 1.
6. Piping and Fittings
7. Pipe Insulation
8. Pipe Supports and Hangers
9. Exterior Refrigerant Piping Enclosure

D. Alternate No. 2: Bathhouse Building

1. Louvers
2. Sheet Metal Ductwork and Fittings
3. Equipment Hangers, Supports
4. Vibration Isolation
5. Fans
6. Controls
7. Submittals
8. Record drawings.
9. Test and Balance
10. Operations and Maintenance Manuals.
11. Provide Close-Out procedures per Division 1.

1.4 RELATED WORK IN OTHER SECTIONS

- A. The following work is not included in this Section and will be performed under other Sections:

1. Division 01 – General Requirements (all sections)
2. Section 260000 – Electrical

1.5 ITEMS SUPPLIED UNDER THIS SECTION FOR INSTALLATION BY OTHER SECTIONS

- A. Disconnects

1.6 QUALITY ASSURANCE

- A. Perform work in strict accordance with rules, regulations, standards, codes, ordinances, and laws of local, state, and Federal governments, and other authorities having lawful jurisdiction, and be responsible for compliance therewith. Such authorities include but are not limited to the following:
1. Local and state building, plumbing, mechanical, electrical, fire, and health department and public safety codes.
 2. Maine Energy Code (IECC 2015 with Amendments)
 3. Maine Mechanical Code (IMC 2015 with Amendments)

4. National Fire Protection Association (NFPA).
 5. American Insurance Association (A.I.A.)
 6. Occupational Safety and Health Act (OSHA).
 7. Factory Mutual Association (FM).
 8. Sheet Metal and Air Conditioning National Contractors Association (SMACNA).
 9. Material and equipment shall be Underwriter's Laboratory (UL), ASME and AGA approved, as applicable, for intended service.
- B. When two or more codes, regulations, etc. conflict with each other or with Contract Documents, the more severe requirement shall govern conduct of work. The Engineer may relax this requirement at his sole discretion when such relaxation does not violate ruling of any authority having jurisdiction. Approval for such relaxation must be obtained in writing.
- C. Most recent editions of applicable specifications and publications of the following organizations form part of the Contract Documents.
1. American National Standards Institute (ANSI).
 2. American Society of Mechanical Engineers (ASME).
 3. National Electric Manufacturers Association (NEMA).
 4. American Society for Testing and Materials (ASTM).
 5. American Society for Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE).
 6. Sheet Metal and Air Conditioning National Contractors Association (SMACNA).
 7. National Insulation Manufacturers Association (NIMA).

1.7 SUBMITTALS

- A. Submit the following in accordance with Conditions of the Contract and Division-1 Specification Sections.
- B. Material and equipment requiring Shop Drawings or Product Data submittal shall include but shall not be limited to:
1. Heat Pump Systems
 2. Automated Temperature Controls
 3. Fans
 4. Louvers
 5. Sheet Metal Ductwork
 6. Piping and Fittings
 7. Pipe Insulation
 8. Pipe Supports and Hangers
 9. Exterior Refrigerant Piping Enclosure
- C. Submit manufacturer's installation instructions, service manuals, and parts lists under applicable provisions.
- D. Submit a line-item schedule of values for review prior to equipment submittals for use in the requisition process.

- E. Submit a schedule for the work in coordination with the G.C.'s schedule.
- F. Submit blank test and balance report forms.
- G. Submit lead-time requirements for any equipment with more than a three-week lead-time.
- H. At substantial completion, prepare a set of record drawings per Division 1.

1.8 UNDERWRITERS' LABEL AND LISTING

- A. All electrical apparatus furnished under this section shall be approved by the UL and shall be labeled or listed where such is applicable. Where custom built equipment is specified and the UL label or listing is not applicable to the completed product, all components used to the construction of such equipment shall be labeled or listed by UL where such is applicable to the component.

1.9 OPERATION AND MAINTENANCE MANUALS

- A. The following paragraphs supplement Division 1.
- B. Submit manufacturer's descriptive literature, operating instructions, and maintenance and repair data under applicable provisions.
- C. Provide O&M Manual, three copies in three ring binders marked on the cover with the name of the project and the date of final completion. Each binder shall be divided with labeled tab dividers for the following:
 - 1. Contact information for the installing contractor and the 24-hour service provider.
 - 2. Equipment Warranties,
 - 3. Approved submittals,
 - 4. Operations and maintenance manuals parts lists.

1.10 GUARANTEES AND WARRANTIES

- A. The provisions under Conditions of the Contract and Division 1 are included.
 - 1. Guarantee work of this Section in writing for one year from date of Substantial Completion. Defects in materials, equipment, workmanship or installation that develop within this period shall be repaired and replaced promptly to the Engineer's satisfaction at no cost to owner.
 - 2. Written guarantee shall stipulate that damage caused in making necessary repairs and replacements shall be corrected at no cost to Owner.
 - 3. The HVAC systems will be considered substantially complete only after the system has been fully tested and balanced and the engineer has signed off on the completed test and balance forms.
- B. Guarantee shall include provision of 24-hour service for complete system during

guarantee period at no cost to Owner.

1. Choice of service organization shall be subject to Owner's approval.
- C. Submit written guarantee to the Engineer through Contractor before final payment.
- D. Transfer individual equipment and material guarantees, which are still in force to Owner at end of guarantee period.

1.11 CONTRACT DOCUMENTS

- A. Work to be performed under this Section is shown on the accompanying drawings.
- B. Listing of drawings does not limit responsibility of determining full extent of work required by Contract Documents.
 1. Refer to Architectural, Plumbing, Electrical, Structural and other drawings on file, as well as other specifications sections, which indicate the type of construction in which the work must be installed.
 2. Locations shown on Drawings shall be checked against general and detailed drawings of the construction proper.
- C. Drawings are generally diagrammatic and indicate general arrangements of systems and work included in Contract.
 1. The locations of all items that are not definitely fixed by dimensions are approximate only. The exact locations must be determined at the project site and shall have the approval of the Engineer before being installed. The Contractor shall follow Drawings, including his shop drawings, in laying out work and shall check the Drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions. Where space conditions appear inadequate, notify the Engineer before proceeding with the installation.
 2. Size of ducts and pipes and methods of running them are shown, but it is not intended to show every offset and fitting, nor every structural difficulty that may be encountered. To carry out the true intent and purpose of the Drawings, all necessary parts to make complete approved working systems ready for use, shall be furnished without extra charge. All work shall be installed in such a manner as to avoid being unsightly.
 3. All measurements shall be taken at the building by the Contractor, prior to purchasing and installing the equipment and piping.
- D. Questions regarding drawings or specifications shall be addressed to the Engineer in writing prior to Award of Contract.
 1. Otherwise the Engineer's interpretation of meaning and intent of drawings and specifications shall be final.

1.12 DISCREPANCIES IN DOCUMENTS

- A. Where Drawings or Specifications indicate discrepancies or unclarities, advise the Engineer in writing before Award of Contract.
 - 1. Otherwise, the Engineer's interpretation of documents shall be final; no additional compensation shall be permitted due to discrepancies or unclarities thus resolved.
- B. Where drawings or specifications do not coincide with recommendations of manufacturer of material or piece of equipment, alert the Engineer in writing before installation of item in question.
 - 1. The Contractor shall make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.
 - 2. Otherwise, make changes in installation, as the Engineer requires without additional cost to owner when specifications and drawings are in conflict with each other, or with Contract Documents, the more severe (costly) requirement shall be provided as part of the base bid work.
 - 3. The Engineer may relax this requirement at his sole discretion when such relaxation does not violate the ruling of any authority having jurisdiction.
 - 4. Approval for such relaxation must be obtained in writing.

1.13 RECORD DRAWINGS

- A. Provide Record and Drawings per Division 1 and requirements below.
- B. As work progresses and for duration of Contract, maintain complete and separate sets of prints of Contract Drawings at job site at all times.
 - 1. Record work completed and all changes from original Contract Drawings clearly and accurately. Record valve tags as they are installed.

1.14 COOPERATION AND COORDINATION WITH OTHER TRADES

- A. The work shall be so performed that the progress of the entire building construction, including all other trades, shall not be delayed nor interfered with. Materials and system components shall be installed in a timely manner.
- B. Confer with all other trades relative to location of all apparatus and equipment to be installed and select locations so as not to conflict with work of other Sections.
- C. Keep fully informed as to the shape, size and position of all openings required for all apparatus and give information in advance to build openings into the work. Furnish and set in place all sleeves, pockets, supports and incidentals.
- D. This Contractor shall, with the approval of the Architect and without extra charge, make reasonable modifications in his work as required by normal structural interferences, or by interference with work of other trades, or for proper execution of the work.

1.15

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work performed by Owner.
4. Work under Owner's separate contracts.
5. Owner's product purchase contracts.
6. Owner-furnished/Contractor-installed (OFCI) products.
7. Owner-furnished/Owner-installed (OFOI) products.
8. Contractor-furnished/Owner-installed (CFOI) products.
9. Contractor's use of site and premises.
10. Coordination with occupants.
11. Work restrictions.
12. Specification and Drawing conventions.
13. Miscellaneous provisions.
14. Preconstruction Requirements (MSHA)

1.16 PROJECT INFORMATION

A. Project Identification: Wolfe's Neck Woods and Waters

1. Project Location: Wolfe's Neck Road, Freeport, ME 04032

B. Owner: Department of Agriculture, Conservation and Forestry – Bureau of Parks and Lands, 22 State House Station, 18 Elkins Lane Augusta, Maine 04333

1. Owner's Representative: Owen Blease – owen.blease@maine.gov

C. Architect: Kaplan Thompson Architects, 102 Exchange St, Portland, Maine, 04101.

1. Architect's Representative: Adam Wallace – adam@kaplanthompson.com.

1.17 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:

1. Bathhouse
2. Gatehouse

B. Type of Contract:

1. Project will be constructed under a single prime contract.
2. Project will be constructed under coordinated, concurrent multiple contracts. See Section 011200 "Multiple Contract Summary" for a list of multiple contracts, a description of work included under each of the multiple contracts, and the responsibilities of Project coordinator.

1.18 WORK UNDER OWNER'S SEPARATE CONTRACTS

- A. Work with Separate Contractors: Cooperate fully with Owner's separate contractors, so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under Owner's separate contracts.

1.19 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Unrestricted Use of Site: Each Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. Restricted Use of Site: Each Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- C. Limits on Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
- D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.20 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
 - 3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
 - 4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings, and, published as part of the U.S. National CAD Standard.

PART 2 - PRODUCTS

2.1 SPLIT HEAT PUMP SYSTEM

A. System Description

- 1. The variable capacity, heat pump system shall be a Daikin Inverter Driven series (heat/cool model) split system. The system shall consist of a wall mounted evaporator model FTXM09WVJU9 exclusively matched to outdoor model RXM09WVJU9, FTXM12WVJU9 exclusively matched to outdoor model RXM12WVJU9, FTXM18WVJU9 exclusively matched to outdoor model RXM18WVJU9, and FTXM24WVJU9 exclusively matched to outdoor model RXM24WVJU9 direct expansion (DX), air-cooled, Daikin swing, variable speed, inverter driven compressor using R-32 refrigerant. The outdoor unit is a horizontal discharge, variable speed, single fan unit using a single-phase power supply. The system shall have a self-diagnostic function, 3-minute time delay mechanism and have a factory pre-charge of R-32 adequate for 49.2 feet of total line set length. The system shall have automatic restart capability after a power failure has occurred and a low voltage cut-off feature to prevent stalling during power supply issues.

B. Quality Assurance

- 1. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL), in accordance with ANSI/UL C22.2 No. 60335-2-40— Heating and Cooling Equipment and bear the Listed Mark.
- 2. All wiring shall be in accordance with the National Electric Code (NEC).
- 3. Each combination shall be rated in accordance with Air Conditioning Refrigeration Institute's (ARI) Standard 210/240 and bear the ARI label.
- 4. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
- 5. The outdoor unit will be factory charged for a line set length of 49.2 feet of refrigerant with R-32 refrigerant.
- 6. A holding charge of dry nitrogen shall be provided in the evaporator.
- 7. System Efficiency shall meet or exceed 22.0 SEER2, 12.0 EER2 and 10.0 HSPF2.

C. Delivery, Storage and Handling

1. Unit shall be stored and handled according to the manufacturer's Recommendations.

D. Installation Requirements

1. Installation must comply with installation manual. It is recommended that the system be installed by a contractor/dealer who has been through Daikin training programs.

E. Indoor Unit

1. General: The indoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. Both liquid and suction lines must be individually insulated between the outdoor and indoor units.
2. Unit Cabinet:
 - a. The indoor unit shall have a white, "wipe-clean" finish.
 - b. The drain and refrigerant piping shall be accessible from six (6) positions for flexible installation (right side, right back, and right bottom; and left side, left back, and left bottom).
 - c. The cabinet shall be supplied with a mounting plate to be installed onto a wall for securely mounting the cabinet.
 - d. The cabinet includes:
 - 1) "Intelligent-eye" motion sensor capable of setting back the set point temperature for energy savings. This feature may be disengaged on the I/R remote controller.
 - 2) Indoor unit ON/OFF switch, capable of being used when the remote controller is missing. When switch is used, the default setting is AUTO mode, 77°F temperature setting, and AUTO airflow rate.
 - 3) OPERATION lamp that turns green when activated
 - 4) TIMER lamp that turns orange when activated
 - 5) INTELLIGENT EYE lamp that turns green when activated
 - 6) Wireless LAN connection adapter lamp that turns orange when activated
 - 7) CLEAN lamp that turns green when activated
 - 8) A Signal Receiver that receives signals from the remote controller at a maximum distance of 23 ft. When the unit receives a signal, you will hear the following: 2 beeps – operation start, 1 beep – Setting changed, 1 long beep – Operation stop.
3. Fan:
 - a. The evaporator fan shall be an assembly consisting of a direct-driven fan by a single motor.
 - b. The fan shall be statically and dynamically balanced and operate on a motor with permanent lubricated bearings.
 - c. An auto-swing louver for adjustable air flow (vertically) is standard via the wireless remote control furnished with each system.

- d. The indoor fan shall offer a choice of five speeds, plus quiet and auto settings.
 - e. The fan shall have a delayed start when initially put into HEAT operation, giving time for the evaporator coil to heat up and preventing a cold draft from entering the room.
- 4. Filter:
 - a. The return air filter provided will be a removable and washable filter. Two titanium apatite deodorizing filters are included for additional air filtration.
- 5. Coil:
 - a. The evaporator coil shall be a nonferrous, aluminum fin on copper tube heat exchanger.
 - b. All tube joints shall be brazed with silver alloy or phoscopper.
 - c. All coils will be factory pressure tested.
 - d. A detachable condensate pan shall be provided under the coil with a drain connection.
- 6. Electrical
 - a. The outdoor unit shall be powered with 208-230 volts, 1 phase, and 60 hertz power. The indoor unit shall receive 208-230 volt, 1 phase, 60 hertz power from the outdoor unit.
 - b. The allowable voltage range shall be 187 volts to 253 volts.
- 7. Control:
 - a. The unit shall have a backlit, wireless remote infra-red controller capable to operate the system. It shall have Cooling Operation, Heating Operation, Automatic Operation, Dry Operation and Fan Only Operation.
 - b. The controller shall consist of an On/Off Power switch, Mode Selector, Quiet Button (for outdoor unit)/Econo Mode, Fan Setting, Swing Louver, On/Off Timer Setting, Temperature Adjustment, °C or °F Temperature Display, Intelligent Eye Sensor, Weekly Timer, Night Set Mode, Comfort Mode, Econo Mode, Powerful Operation, and Menu.
 - 1) On/Off switch powers the system on or off.
 - 2) Mode selector shall operate the system in auto, cool, heat, fan, or dry operation.
 - 3) Quiet button for outdoor unit lowers the noise level by changing frequency and fan speed of the outdoor unit.
 - 4) Fan setting shall provide five fan speeds, plus quiet and auto settings.
 - 5) Swing louver shall adjust the airflow (horizontal and vertical) blades.
 - a) Vertical & horizontal positions can be manually adjusted, or placed into auto swing or 3-D airflow settings.
 - 6) Menu button adjusts the display brightness and engages CLEAN

operation.

- a) CLEAN operation dries the interior of the indoor unit to reduce the amount of condensation present.
- 7) On/Off timer is used for automatically switching the unit on or off.
 - a) Night Set mode automatically engaged with Off Timer is set. This setting automatically adjusts the temperature setting 0.9°F (0.5°C) up in COOL, 3.6°F (2.0°C) down in HEAT to prevent excessive cooling or heating during sleeping hours.
- 8) Temperature adjustment allows for the increase or decrease of the desired temperature.
- 9) The Intelligent Eye sensor detects human movement. If no movement is detected in the room for more than 20 minutes, the operation automatically changes up or down 3.6°F to an energy saving operation.
- 10) Weekly timer allows for programming the temperature setting and on/off times of up to four settings per day for each day of the week.
- 11) Comfort Mode directs the airflow upwards while in COOL operation and downward while in HEAT operation. This function prevents air from blowing directly on the occupants in the room.
- 12) Econo operation is a function which enables efficient operation by limiting the maximum power consumption value. This function will also prevent the circuit breaker from tripping when the unit operates alongside other appliances on the same circuit.
- 13) Powerful operation allows quick cool down or heating up in the desired space to achieve maximum desired temperature in the shortest allowable time period.
- c. The controller shall be able to display two-digit fault codes extracted from the indoor unit to aid in troubleshooting.
- d. Temperature range on the remote control shall be 64°F to 90°F in COOL mode, 50°F to 86°F in HEAT mode, and 64°F to 86°F in AUTO mode. The temperature shall be controlled in 1° increments.
- e. The indoor unit microprocessor has the capability to receive and process commands via return air temperature and indoor coil temperature sensors enabled by commands from the remote control.
- f. The unit shall also have the capability to connect to a smart-device app via a built-in wireless LAN connection adapter.

F. Outdoor Unit

- 1. General: The outdoor unit shall be specifically matched to the corresponding indoor unit size. The outdoor unit shall be complete factory assembled and pre-wired with all necessary electronic and refrigerant controls. The outdoor shall be controlled by a microprocessor and dedicated EEV's shall be provided for capacity control during part load of the indoor unit.
- 2. Unit Cabinet:

- a. The outdoor unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.
 - b. The outdoor unit will come furnished with four (4) mounting feet, mounted across the base pan, to allow bolting to a cement pad or optionally supplied mounting bracket.
 - c. This assembly will be able to withstand a maximum rated wind pressure of 119 psf Lateral, 94 psf Uplift. See document TER-20-34269.
3. Fan:
 - a. The fan shall be a direct drive, propeller type fan.
 - b. The motor shall be inverter driven, permanently lubricated type bearings, inherent.
 - c. A fan guard is provided on the outdoor unit to prevent contact with fan operation.
 - d. Airflow shall be horizontal discharge.
4. Coil:
 - a. The outdoor coil shall be nonferrous construction with corrugated fin tube.
 - b. The fins are to be covered with an anti-corrosion acrylic resin and hydrophilic.
 - c. Refrigerant flow from the condenser will be controlled via a metering device.
 - d. Automatic defrost will remove any frost from the outdoor unit allowing the system to maintain heating capacity.
5. Compressor:
 - a. The outdoor compressor shall be a patented, variable speed Daikin swing inverter-driven compressor. The one-piece action reduces noise, extends life, boasts higher efficiency and reduces energy consumption.
 - b. The outdoor unit shall have an accumulator and four-way reversing valve.
 - c. PVE Refrigerant Oil shall be used to provide improved lubrication & better chemical stability, and no hydrolysis, leading to higher product reliability.
 - d. The compressor shall have an internal thermal overload.
 - e. The outdoor unit can operate with a maximum vertical height difference of 65-5/8 feet for 9k btu and 12k btu and 82-1/64 feet for 18k btu and 24k btu without any oil traps or additional components.
 - f. The outdoor unit can operate with an overall maximum length of 82-1/64 feet for 9k btu and 12k btu and 98-1/2 feet for 18k btu and 24k btu without any oil traps or additional components.
6. Electrical:
 - a. The electrical power requirement is 208-230 volt, 1-phase, and 60 Hz power.
 - b. The voltage range limitations shall be a minimum of 187 volts and a maximum of 253 volts.

2.2 FANS

A. Manufacturer

1. Exhaust fans shall be manufactured by Greenheck, ACME, Cook, or approved equal.

B. Quality Assurance

1. Performance ratings: Conform to AMCA standard 211 and 311. Fans must be tested in accordance with ANSI/AMCA Standard 210-99 and AMCA Standard 300-96 in an AMCA accredited laboratory. Fans shall be certified to bear the AMCA label for air performance seal
2. Classification for Spark Resistant Construction, levels A, B and C, conform to AMCA 99
3. Each fan shall be given a balancing analysis which is applied to wheels at the outside radius. The maximum allowable static and dynamic imbalance is 0.05 ounces (Balance grade of G6.3)
4. Comply with the National Electrical Manufacturers Association (NEMA), standards for motors and electrical accessories
5. The High Wind models have been analyzed and stamped by a state license P.E. to the ASCE 7-02 Standard which meets the IBC, Florida and Miami-Dade codes
6. Each High Wind model is subject to be certified by a third party to the ASTM E330 Static Pressure Difference Standard
7. All High Wind models have been analyzed using Computational Fluid Dynamics (CFD). The CFD simulates the flow of high speed (150MPH) winds over the surface of objects
8. The Finite Element Analysis (FEA) is the results from the CFD and it can accurately predict the stress, strain, and deflection resulting from high wind loads

C. Delivery, Storage, and Handling

1. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer, material, products included, and location of installation
2. Storage: Store materials in a dry area indoor, protected from damage, and in accordance with manufacturer's instructions. For long term storage follow manufacturer's Installation, Operations, and Maintenance Manual
3. Handling: Handle and lift fans in accordance with the manufacturer's instructions. Protect materials and finishes during handling and installation to prevent damage. Follow all safety warnings posted by the manufacturer

D. Warranty

1. 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
 - a. The warranty of this equipment is to be free from defects in material and workmanship for a period of 1 Yr (Standard) from the purchase date. Any

units or parts which prove defective during the warranty period will be replaced at the Manufacturers option when returned to Manufacturer, transportation prepaid

- b. Motor Warranty is warranted by the motor manufacturer for a period of one year. Should motors furnished by us prove defective during this period, they should be returned to the nearest authorized motor service station

2. Maintenance

- a. Refer to Manufacturer's Installation, Operation and Maintenance Manual (IOM), to find maintenance procedures.

E. Direct Drive Sidewall Mounted Propeller Fans

1. General Description:

- a. Fan arrangement shall be exhaust
- b. Sidewall mounted applications
- c. Performance capabilities up to 7,100 cubic feet per minute (cfm) and static pressure to 0.625 inches of water gauge
- d. Fans are available in eight sizes with nominal wheel diameters ranging from 8 inches through 24 inches (8 - 24 unit sizes)
- e. Maximum continuous operating temperature 130 Fahrenheit (54.4 Celsius)
- f. Each fan shall bear a permanently affixed manufacture's engraved metal nameplate containing the model number and individual serial number

2. Wheel:

- a. Propeller shall be aluminum blade riveted to steel hub
- b. A standard square key and set screw or tapered bushing shall lock the propeller to the motor shaft
- c. Statically and dynamically balanced in accordance to AMCA Standard 204-05
- d. The propeller and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency

3. Motors:

- a. Motors are permanently lubricated, sleeve bearing type on sizes 8-12 and ball bearing type on sizes 14-24 to match with the fan load and furnished at the specific voltage and phase
- b. Accessible for maintenance

4. Drive Frame:

- a. Drive frame assemblies and fan panels shall be galvanized steel
- b. Drive frame shall have welded wire or formed channels and fan panels shall have prepunched mounting holes, formed flanges and a deep formed one piece inlet venturi

5. Options/Accessories:

- a. Dampers:
 - 1) Type: Motorized, 115 VAC
 - 2) Prevents outside air from entering back into the building when fan is off
 - 3) Balanced for minimal resistance to flow
 - 4) Galvanized frames with prepunched mounting holes
- b. Damper Guard
 - 1) Guard Material: Aluminum
 - 2) Shall completely enclose the damper or wall opening on the discharge side of the fan.
- c. Wall Housing Mounting
 - 1) Fan panel will be mounted vertically directing the air horizontally out of the building. Wall Housing will be mounted in a manner that will not have any housing protruding outside of the building. Motor and drives will be accessible from the interior of the building
 - 2) Constructed of galvanized steel with heavy gauge mounting flanges and prepunched mounting holes
 - 3) Housing shall include OSHA approved motor guard
 - 4) Final product will be fully assembled including motor and drive

2.3 LOUVERS – NON-DRAINABLE, SIGHTPROOF

A. Manufacturer

- 1. Exhaust fans shall be manufactured by Ruskin Company, Greenheck, United Enertech, or approved equal.

B. Fabrication:

- 1. Design: Stationary inverted chevron blade louver type with mechanically fastened construction. Hidden vertical supports to allow limited continuous line appearance
- 2. Frame:
 - a. Frame Depth: 3 inches (76.2 mm).
 - b. Wall Thickness: 0.081 inch (2.1 mm), nominal.
 - c. Material: Extruded aluminum, Alloy 6063-T6.
- 3. Blades:
 - a. Style: Inverted Chevron 45 degrees spaced at 1 7/16 inches (36.5 mm), nominal.
 - b. Wall Thickness: 0.081 inch (2.1 mm), nominal.
 - c. Material: Extruded aluminum, Alloy 6063-T6.

4. Minimum Assembly Size: 12 inches wide by 12 inches high (305 mm x 305 mm).
5. Maximum Factory Assembly Size: Single sections shall not exceed 72 inches wide by 144 inches high (1829 mm x 3658 mm). Louvers larger than the maximum single size shall require field assembly of smaller sections.
6. Recycled Content: 18% post-consumer. 55% pre-consumer, post-industrial, total 73% by weight.

C. Performance Data:

1. Based on testing 48 inch x 48 inch (1,219 mm x 1,219 mm) size unit in accordance with AMCA 500.
2. Free Area: 57 percent, nominal.
3. Free Area Size: 9.08 square feet (0.844 m²)
4. Not tested for pressure drop or threshold of water penetration.

D. ACCESSORIES

1. Aluminum Blank-Off Panels: 0.040 (1 mm) aluminum sheet, factory installed with removable fasteners and neoprene gaskets.

E. Design Windload: Per Code.

F. Louvers shall be factory engineered to withstand the specified seismic loads.

1. Minimum design loads shall be calculated to comply with ASCE – 7, or local requirements of Authority Having Jurisdiction (AHJ).

G. Finishes

1. Finish: Epoxy-Based Painted Finish.
2. Color: Coordinate final finish with Architect and General Contractor.

2.4 PIPING AND FITTINGS

- A. Unless otherwise noted, all piping fittings, including nipples, shall be new material absolutely perfect throughout, scale free, and of the best grade guaranteed full weight. All steel pipe shall be as manufactured by National Tube Co., Youngstown Sheet & Tube Co., Bethlehem Steel Co.. Copper tubing shall be as manufactured by Bridgeport Brass, American Brass, Revere Copper and Brass. The manufacturer's name or brand shall be rolled or stamped on each length of pipe and nipple. All piping shall conform to American Standards Association "Code for Pressure Piping
- B. All nipples and fittings shall be of the same material and thickness as the pipe which they are used, except as otherwise noted and/or where screwed fitting are used on steel pipe, in which case they shall have band and clean cut, full taper thread. Welding fittings shall be standard weight, conforming to ASA B36.10. Welding elbows shall be long radius patter, unless otherwise specifically authorized for each location.
- C. Mechanical press fittings for hot water, cold water and condensate piping shall be as manufactured by Viega (ProPress), Cerro (Advantage Press) or Apollo (Xpress).

- D. Mechanical press fittings for refrigerant RS & RL piping shall be as manufactured by Parker Hannifin (Zoomlock), Conex Banniger (>B< MaxiPro) or Rapid Locking System (RLS).

E. Schedule of Pipe Fitting Materials

SERVICE	MATERIAL	JOINTS	FITTINGS
Refrigerant	Copper, Refrigerant ACR ASTM B-280	Copper Braze	Wrought Copper
Refrigerant	Copper, Refrigerant ACR ASTM B-280	Copper Mechanical press with electric-hydraulic tool	Refrigerant Grade Copper, per ASTM- B75 or ASTM-B743
Condensate	PVC Schedule 40	PVC Schedule 40	Solvent Weld
Condensate	Copper Type – L , CTS (ASTM B88)	Soldered with 95%Tin/5% Antimony lead free solder (ASTM B32)	Wrought Copper (ASTM B16.22)
Condensate	Copper Type – L, CTS	Mechanical press with electric-hydraulic tool	Copper and Bronze with EPDM seal

F. Copper Tube and Fittings

1. Drawn-Temper Copper Tube: ASTM B 280, Type ACR, clean, dry and capped.
2. Annealed-Temper Copper Tube: ASTM B 280, Type ACR, clean, dry and capped. Annealed copper tubing shall not be used for piping larger than 0.625 O.D.
3. Wrought-Copper Fittings: ASME B16.22.
4. Bronze Filler Metals: AWS A5.8, Classification Bag-7 (50 % silver), BcuP5 (15% Silver).

G. Brazed Joints

1. When brazing, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion valve bulb. Joints shall be cool before reassembling valve.
2. Tubing shall be cut square, reamed, and burrs removed.
3. Both inside of fittings and outside of tubing shall be well cleaned with an abrasive cloth or stainless-steel wire brush before brazing. Steel wool is NOT permitted.
4. During brazing an inert gas (such as dry nitrogen, argon) shall be continuously passed through the system at a flow rate sufficient to maintain an oxygen-free environment to prevent the formation of copper oxide scale.
5. Care shall be taken to prevent annealing of fittings and tubing when making connections.
6. Copper to copper joints shall be brazed with a copper-phosphorous brazing alloy containing a minimum of 15% silver and conforming to AWS A5.8, BcuP5.
7. Copper to brass joints shall be brazed with a silver brazing alloy containing a minimum of 50% silver and conforms to AWS 5.8, Bag-7.

8. Copper to stainless steel joints shall be brazed with a silver brazing alloy containing a minimum of 50% silver and conforms to AWS 5.8, Bag-7.
9. All brazed joints shall be cleaned to remove residual flux.

H. Mechanical Refrigerant Pipe Compression System Parameters

1. Approved Tubing Tolerance: ASTM B280, UNI EN 12735
2. Continuous Operating Temperature: 250°F / 121°C
3. O-Ring Temperature Rating: -40°F to +300°F / -40°C to +149°C
4. Maximum Rated Pressure (MRP): 700 psi / 48 bar
5. Minimum Burst Pressure (UL 207): 2,100 psi / 145 bar
6. Vacuum Pressure Capability: 20 Microns
7. External Leak Rate: <0.1 Ounces of Helium per Year at Operating Pressure Range

I. UL Listed: 207, SA#33958,

1. SDTW(7) (Except where noted)
2. UL Listed: Approved use for field and factory installations
3. ASHRAE-15, ANSI 15, ASME B31.5, ANSI 31.5
4. ICC-ES, PMG-1296
5. 2018, 2015, 2012, 2009, 2006
6. International Mechanical Code (IMC) 2018, 2015, 2012, 2009, 2006
7. International Residential Code (IRC) 2018, 2015, 2012, 2009, 2006
8. Uniform Mechanical Code (UMC)

2.5 SHEET METAL DUCTWORK

A. General

1. Material, construction and installation shall meet requirements of most recent editions of the following standards and references, except as otherwise specified or shown on Drawings:

Standard	As Applicable To
SMACNA Low Pressure duct Construction Standards (SMACNA-LPDS)	Low Pressure Duct
NFPA 90A	Fire Dampers; Fire Resistance Standard for Ducts and Liners
ADC Test Code 106 R4	Ratings of Diffusers, Registers, Grilles

2. Provide supporting and hanging devices necessary to attach entire Mechanical system including ductwork and equipment, and to prevent vibration.
3. Provide vertical and horizontal supports as required by codes to meet minimum earthquake resistance standard for geographical area.

B. General – Sheet Metal Ductwork

1. Ductwork shall be free from vibration under all conditions of operation.
2. Pipe or conduit crossing duct:
 - a. No pipe or conduit shall pass through duct without approval of Engineer.
 - b. Where it is impossible to re-route pipe or conduit and when written approval has been obtained, increase duct size to maintain constant cross-sectional area at point of interference.
 - c. Provide streamlined enclosure for pipe or conduit, as illustrated in SMACNA LPDS.
3. When making offsets and transformations necessary to accommodate structural conditions, preserve full cross-sectional area of ductwork shown on Drawings.
4. Ductwork shall have the following pressure-velocity classifications:

Duct Class	Static Pressure Rating	Pressure	SMACNA Seal Class	Velocity
Low Pressure	2 in.	Pos or Neg	B	2500 fpm or less

5. Sealants
 - a. Seal duct joints and joints between fittings and ducts with 3M, United Sheet metal or approved equal sealant as required by manufacturer's instructions.
 - b. Make and seal duct joints properly. Apply sealant over joint lines and screws. Coverage shall be 1-inch wide on each side of joint. When joint is inaccessible for sealing from outside, cut hand-hole in duct to seal joint from inside. Where possible, sealing shall be on inside of ductwork.
 - c. Before assembling fittings and joints, apply sealer to rivets, grooved seams and top-off collars on inside of ductwork. Flood Pittsburgh lock pocket and the zoning plants with sealer.
 - d. Brush sealer around washers, corners, notches and top-off collars after assembling ducts.
 - e. Coat inside of connecting lap of slip joints and duct surface with sealer.
 - f. Do not use tape to seal sheet metal ducts.
6. Provide volume damper, or other approved air balancing device, with indicating and locking quadrant at each branch from main duct, at each duct take-off and at each neck to individual diffuser or register in supply, return or exhaust ducts.
7. Support
 - a. Support vertical duct on each floor or slab it penetrates.
 - b. Supports for ductwork and equipment shall be galvanized unless specified otherwise.
8. Connections
 - a. Provide flexible connections at all RTU connections. Flexible connections shall be fire retardant fabric, by Vent fabrics or approved equal.
9. Construction

- a. No sharp metal edges shall extend into air streams.
- b. Install slip on air-leaving side of duct with sheet metal screws on 6-inch centers.

10. Joints

- a. Longitudinal lock seams shall be double-locked and flattened to make tight joints.
- b. Make transverse joints, field connections, collar attachments and flexible connections to ducts and equipment with sheet metal screws or bolts and nuts. Do not use rivets and staples.

11. Elbows and Bends

- a. Elbows and bends for rectangle ducts shall have centerline radius of 1½ times duct width wherever possible.
- b. Where centerline radius is less than 1 ½ times duct width (on supply and return duct work), supply air elbows shall have single thickness turning vanes. Fasten vanes to runners in installed operating position. Install vanes in accordance with SMACNA LPDS.

12. Duct Termination

- a. End of duct sections shall be notched and lapped on. Connect ends with bar slips, S-slip and drive caps. Slips shall be made in form of frames, mitered and riveted at corners to prevent leakage.

13. Leakage

- a. Test ducts before applying exterior insulation. Correct leaks. Leakage noise shall not be audible from any point in ductwork at distance of 3 feet, as determined by Engineer.

14. Materials

- a. Sheet metal ducts shall be constructed of hot-dipped galvanized sheet metal with G90 commercial costing according to ASTM 525 unless specified otherwise.

C. Low Pressure Ductwork – Rectangular

- 1. Ducts wider than 19 inches with more than 10 square feet of unbraced panel shall be beaded or cross braced unless they have nonconductive covering or acoustical liner. Use Internal stiffening struts where required and where directed by engineer.
- 2. Make changes in duct size with tapered connections as required by SMACNA LPDS.
- 3. Transverse joints shall be made with slip joints; use flat or standing seam according to SMACNA LPDS. Where duct size requires standing seam but space restrictions dictate flat seam, flat seam may be used if shown and approved on shop drawings.

D. Low Pressure Ductwork – Spiral Sheet Metal Ductwork

1. Construct per SMACNA. Provide submittal detailing spiral duct manufacturing standards and custom fabricated connection from spiral to diffusers.
2. Provide acid wash and proper preparation for painting.
3. Provide one coat of compatible primer. Provide submittal.
4. Provide two finish coats of paint, coordinate color selection with Engineer by providing a submittal.

E. Low Pressure Ductwork – Round

1. Construct per SMACNA.
2. Seal all joints with a liquid sealer.

F. Low Pressure Ductwork – Bathroom Exhaust

1. All ductwork shall be rigid Aluminum.
2. Provide liquid sealants for all joints and seams.
3. All longitudinal seams shall be oriented up. Avoid dips and sags in which condensate can collect.

G. Low Pressure Ductwork – Pre Insulated Flexible Ductwork

1. Flexible ducts shall have an impervious core with wire reinforcement. The inner duct shall be covered with fiberglass insulation with an vapor barrier covering.
2. See insulation specification for requirements.
3. Flex duct shall be UL 181 listed and shall meet all local codes.
4. Adjustable stainless steel or nylon bands shall be used to connect duct to registers and fittings. A second band shall be installed over the outer jacket, to maintain the vapor barrier.
5. Flexible duct length shall be limited to connections between trunk ducts and diffusers, not to exceed four feet.
6. All flexible ducts shall be fully stretched to reduce resistance.
7. Support the flexible duct with adequate hangers to relieve the strain on any fittings. Unnecessary bends, twists, etc. will not be permitted.

2.6 REGISTERS, GRILLES, AND DIFFUSERS

A. Manufacturers – Acceptable manufacturers:

1. Price
2. Titus
3. Metalaire
4. Or approved equal

B. General

1. Shall be ADC certified and tested and shall be rated in accordance with ADC.
2. Shall handle air quantities at operating velocities with maximum diffusion within space supplied or exhausted.

3. Shall operate without objectionable air movement as determined by Engineer.
4. Shall operate with sound pressure levels not to exceed NC 25.
5. Return grilles shall be provided for return inlets and shall be sized, at no greater than 300 feet per minute face velocity.
6. Diffusers, registers and grilles shall be furnished with gaskets and installed with faces set level and plumb, tightly against mounting surface. See drawings for schedule. All air terminations shall be white.
7. All supply diffusers shall be supplied with opposed blade volume damper operable through the face of the diffuser.

C. Air Terminals:

1. Exhaust / Return Grilles / Registers (ER)
 - a. Furnish and install aluminum louvered return grilles and registers of sizes and mounting types designated by the plans and air distribution schedule.
 - b. Grilles shall be 45 degree deflection fixed louver type, and shall have:
 - 1) One set of blades with $\frac{3}{4}$ inch on center blade spacing.
 - c. The grilles front blade orientation shall be (select one), as indicated on the outlet schedule.
 - 1) Front blades parallel to the long dimension.
 - d. The blades and border shall be extruded aluminum construction.
 - e. The minimum grille size shall be six inches by four inches. The maximum one-piece grille size shall be 36 inches x 96 inches
 - f. Opposed blade Damper
 - 1) The register shall be supplied with a coated aluminum opposed blade damper. The damper shall be operable from the register face.

2.7 PIPE INSULATION

- A. All pipes, valves, fittings, flanges, and similar elements conveying fluids above or below ambient temperature shall be insulated as follows:
 1. Provide material and thickness as indicated in on Mechanical Drawings under Pipe Insulation Schedule.
- B. Insulation, jackets and adhesives shall be flame retardant. Fire and smoke Hazard ratings to be as tested under procedure ASTM E-84, NFPA 255 and UL 723, not exceeding:
 1. Flame spread: 25
 2. Smoke Developed: 50
- C. Fiberglass:

1. Insulation shall be rigid, molded, noncombustible complying with the requirements of ASTM C 547, ASTM C 585, and ASTM C 795.
 2. Pipe Insulation
 - a. K factor as indicated in the table above.
 - b. Maximum Service Temperature: 1000° F.
 - c. Vapor Retarder Jacket: Jacket shall conform to ASTM C 1136 Type I, secured with self-sealing longitudinal laps and butt strips.
 - d. Insulation shall be as manufactured by Owens-Corning, Certain-Teed, Manville or Knauf.
 3. Field-Applied Jackets or Fitting Covers
 - a. Fitting Covers: Fitting cover system shall consist of pre-molded, high-impact PVC materials with fiber glass inserts. Fiber glass insert has a thermal conductivity ('K') of 0.26 at 75° F. mean temperature.
 - b. Closures: PVC adhesive
- D. Exterior Pipe Insulation
1. For piping exposed to the elements, jacketing shall be Outdoor Weather Rated PVC with a minimum thickness of 0.020 inches. Fitting covers shall be of similar materials.
- E. Flexible Foam: Insulation shall be flexible elastomeric expanded closed-cell foam, thermal insulation complying with the requirements of ASTM C 534, and ASTM D 1056.
1. Tubing to be factory slit.
 2. Thermal Conductivity: 0.25 Btu in/h°F.
 3. For foam insulation exposed to sunlight: coat with compatible exterior paint-on coating to prevent degradation by UV light. Provide separate submittal for this product.
 4. Insulation shall be as manufactured by Armaflex by Armstrong or equal by Armacell or K- Flex.
- F. Use glues, tapes and mastics that are from the same manufacturer as the insulation itself and compatible with the insulation material. Provide separate submittal for these products.
- G. Insulation Covering for Impact Protection: Covering to be Aluminum, 0.016-inch thick with embossed finish with factory applied moisture barrier. Overlap shall be 2-inch minimum. Fittings shall be die-shaped with factory-applied moisture barrier.
- 2.8 PIPE HANGERS
- A. Uninsulated pipes 2 inch and smaller:
1. Adjustable steel swivel ring (band type) hanger.
 2. Adjustable steel swivel J-hanger.

3. Malleable iron ring hanger or hinged ring hanger.
 4. Malleable iron split-ring hanger with eye socket.
 5. Adjustable steel clevis hanger. (MSS Type 1)
- B. Uninsulated pipes 2-1/2 inch and larger:
1. Adjustable steel clevis hanger.
 2. Pipe roll with sockets.
 3. Adjustable steel yoke pipe roll.
- C. Pipe Clamps
1. When flexibility in the hanger assembly is required due to horizontal movement, use pipe clamps with weldless eye nuts. For insulated lines use double bolted pipe clamps.
- D. Multiple or Trapeze Hanger
1. Trapeze hangers shall be constructed from 12 gauge roll formed ASTM A1011 SS Grade 33 structural steel channel, 1-5/8 inch by 1-5/8 inch minimum or stronger as required.
 2. Mount pipes to trapeze with 2 piece pipe straps sized for outside diameter of pipe.
- E. For pipes subjected to axial movement:
1. Strut mounted roller support. Use pipe protection shield or saddles on insulated lines.
 2. Strut mounted pipe guide.
- F. Wall Supports
1. Pipes 4 inch and smaller:
 - a. Carbon steel hook.
 - b. Carbon steel J-hanger.
- G. Vertical Supports
1. Steel riser clamp sized to fit outside diameter of pipe.
- H. Copper Tubing Supports
1. Hangers shall be sized to fit copper tubing outside diameters.
 2. Adjustable steel swivel ring (band type) hanger.
 3. Malleable iron ring hanger or hinged ring hanger.
 4. Malleable iron split-ring hanger with eye socket.
 5. Adjustable steel clevis hanger.
 6. For supporting vertical runs use epoxy painted or plastic coated riser clamps,.
 7. For supporting copper tube to strut use epoxy painted pipe straps sized for

copper tubing or plastic inserted vibration isolation clamps.

I. Insulation Shields:

1. Shield for Insulated Piping 2 Inches and Smaller: 18 gage galvanized steel shield over insulation to cover the lower 180 degree of pipe, minimum 12 inches long centered on pipe support.
2. Shields for Insulated Piping 2-1/2" and larger: 16 gage galvanized steel shield over insulation to cover the lower 180 degree of pipe, minimum 12 inches long centered on pipe support.

J. Shields for Vertical Copper Pipe Risers: Sheet lead. Pipe Protection Saddles

1. Pipe protection saddles shall be formed from carbon steel, 1/8 inch minimum thickness, sized for insulation thickness. Saddles for pipe sizes greater than 12 inch shall have a center support rib.

K. Hanger Finishes

1. Indoor Finishes

- a. Hangers and clamps for support of bare copper piping shall be coated with copper colored epoxy paint. Additional PVC coating of the epoxy painted hanger shall be used where necessary.
- b. Hangers for other than bare copper pipe shall be zinc plated in accordance with ASTM B633.
- c. Strut channels shall be pre-galvanized in accordance with ASTM A653 SS Grade 33 G90 or have an electro-deposited green epoxy finish.

2. Outdoor and Corrosive Area Finishes

- a. Hangers and strut located outdoors shall be hot dip galvanized after fabrication in accordance with ASTM A123. All hanger hardware shall be hot dip galvanized or stainless steel. Zinc plated hardware is not acceptable for outdoor use.

2.9 VIBRATION ISOLATION

- A. For each element of rotating Mechanical equipment, provide vibration isolation to reduce the transmission of vibration from the equipment to the supporting building member.
- B. Provide ribbed neoprene and cork pads for mounting of floor mounted equipment unless noted otherwise.
- C. Provide spring and neoprene hangers for horizontal air handlers, fan coils, exhaust fans, supply fans, and air to air heat exchanger units.
- D. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with steel pipe or 18 gauge galvanized steel.

- E. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- F. Provide copper plated hangers and supports for copper piping.

2.10 AUTOMATIC TEMPERATURE CONTROLS

- A. Provide stand alone control systems to properly operate and control all elements of the new Mechanical systems. This Mechanical subcontractor shall be responsible for all control work for all new mechanical equipment.
- B. This Mechanical subcontractor shall also inspect the function of the existing mechanical systems that will remain in the areas of work and report deficiencies in writing.
- C. Supply and install all materials necessary to connect control components factory supplied as part of equipment controlled, unless specified otherwise.
- D. Provide shop drawings and product data submittals indicating controls and their schematic layout. Include sequences of operation, wiring diagrams, etc. Wiring (General): All line voltage automatic temperature control wiring shall be run in EMT (above 30 VAC). All low voltage control wiring shall be run in EMT in Mechanical rooms and run using independently supported plenum rated cable in areas above dropped ceilings or other concealed locations where damage to the wiring will not occur. Conduit is required wherever wiring would be exposed to public view.
- E. Provide wiring and conduit coordination drawings prior to construction.
- F. Installation shall be closely coordinated with fire alarm and electrical contractors.

PART 3 - EXECUTION

3.1 SPECIAL RESPONSIBILITIES

- A. Coordination: Cooperate and coordinate with other trades in executing work of this section as described hereunder.
 - 1. Perform work so that progress of entire project including work of other trades whether involved in work of this or other Sections shall not be interfered with or delayed.
 - 2. Provide information as requested on items furnished under this Section which shall be installed under other Sections.
 - 3. Obtain detailed information from manufacturers of equipment to be provided under this Section as to proper methods of installation.
 - 4. Obtain final roughing dimensions or other information as needed for complete installation of all items furnished under other Sections or by Owner.
 - 5. Keep fully informed as to shape, size and position of openings required for material or equipment to be provided under this and other Sections.

- a. Give full information so that openings required by work of this Section may be coordinated with other work and other openings may be provided for in advance.
 - b. In case of failure to provide necessary and sufficient information in proper time, trade involved will be required to do cutting and patching or have same done, at own expense and to full satisfaction of Engineer.
 6. Notify Engineer of location and extent of piping, ductwork and equipment of other trades which interferes with the work of this section.
 - a. In coordination with and with approval of Engineer, relocate such piping, wiring and equipment to permit new work to be provided as required by Contract Documents.
- B. Maintenance of equipment and systems: Provide maintenance for Mechanical equipment and systems until final acceptance by Engineer and Owner, and take such measures as necessary to ensure adequate protection of equipment and material during delivery, storage, installation and shutdown conditions.
 1. This responsibility shall include provisions required to meet conditions incidental to delays pending final test of systems and equipment under seasonal conditions.
- C. Use of Premises: Use of premises shall be restricted as directed in Division 1 and as required below.
 1. As required, during progress of work, remove and properly dispose of resultant dirt and debris, and keep premises reasonably clean.
 - a. Upon completion of work, remove equipment and unused material provided for work, and put building and premises in neat and clean condition, and do cleaning and washing required to provide acceptable appearance and operation of equipment, to satisfaction of Engineer, and as specified under paragraph "CLEANING".
 - b. Conduct work so as not to interfere with functioning of existing sewers and water and gas mains. Extreme care shall be observed to prevent debris from entering piping. Confer with Engineer as to disruption of water service or other utilities due to testing or connection of new work to existing.
- D. Superintendence: Keep superintendent or foreman on site during progress of work. Instructions given to such representative by Engineer shall be binding of Contractor.
 1. Do not change representative without prior notification to Engineer.
- E. Inspections by Engineer: Undertaking of periodic inspections by Engineer or designated agent shall not be construed as supervision of actual construction, nor make either responsible for providing safe place for performance of work of various trades or suppliers, or for visitors or occupants, or make either responsible for omission of safety devices called for by codes, ordinances, or specifications of manufacturer of equipment supplied.
- F. Surveys and Measurements

1. Base measurements, both horizontal and vertical, on reference points established by Contractor and be responsible for correct laying out of work.
2. In event of discrepancy between actual measurements and those indicated, notify Engineer in writing and do not proceed with work until Engineer has issued written instructions.

G. Firestopping and proofing:

1. Contractor shall provide fire stopping of all penetrations through fire rated partitions. Fire stopping shall comply with UL listing requirements.
2. It is this contractor's responsibility to obtain the architect's drawings and understand the fire rated partitions within all areas of work.
3. Patching and repairing of spray fireproofing due to cutting or damaging to fireproofing during course of work specified under this Section shall be performed by installer of fireproofing and paid for by trade responsible for damage and shall not constitute grounds for an extra to Owner.

3.2 PIPE HANGERS AND SUPPORTS

- A. Hangers shall be arranged to maintain the required grading and pitch of piping, to prevent vibrations, and to provide free, guided, expansion and contraction between anchors.
- B. Support riser piping independently of connected horizontal piping.
- C. Place a hanger within 12 inches of each horizontal elbow.
- D. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers. Trapeze hangers shall be spaced according to the smallest pipe size, or install intermediate supports according to schedule in this section.
- E. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
- F. Horizontal piping shall be supported in accordance with MSS SP-69 and as follows:

PIPE SIZE	MAX. HANGER SPACING	HANGER DIAMETER
½ to 1-1/4 inch	6'-0"	3/8"
1-1/2 to 2 inch	10'-0"	3/8"
2-1/2 to 3 inch	10'-0"	1/2"
4 to 6 inch	10'-0"	5/8"
8 to 12 inch	14'-0"	7/8"

- G. Support vertical piping at each floor but no more than ten-foot intervals.
- H. Provide means of preventing dissimilar metal contact such as plastic coated hangers, copper colored epoxy paint, or non adhesive isolation. Galvanized felt isolators sized for copper tubing may also be used.

- I. Do not support piping from other pipes, ductwork or other equipment that is not building structure.

3.3 MATERIALS AND WORKMANSHIP

- A. Work shall be executed in workmanlike manner and shall present neat and Mechanical appearance when completed.
 1. Ductwork and piping shall run concealed except in Mechanical rooms and areas where no hung ceiling exists unless otherwise shown on drawings.
 2. Material and equipment shall be installed according to the manufacturer's recommended best practice such that completed installation shall operate safely and without leakage, undue wear, noise, vibration, corrosion, or water hammer.
 3. Use of dielectric couplings between dissimilar materials is mandatory. Work shall be properly and effectively protected, and pipe openings shall be temporarily closed to prevent obstruction and damage prior to completion.
- B. Fully ensure workmen and work as required.
- C. Except as otherwise noted, material or equipment mentioned in these Specifications or on Drawings shall be furnished new.
 1. Provide supplies, appliances, and connections necessary for complete and operational installation.
 2. Equipment shall be provided with components required or recommended by OSHA and applicable NFPA documents and shall be UL approved where applicable.
 3. Protection facilities including expanded metal guards over belt drives and couplings shall be provided in conformance with OSHA standards and all other applicable regulations.
- D. Notwithstanding any reference in Specifications or on Drawings to material or piece of equipment by name, make or catalog number, such reference shall be interpreted as establishing type, function, and standard of quality desired and shall not be construed as limiting competition.
- E. Finish of materials, components and equipment shall not be less than industry good practice. When material or equipment is visible or subject to corrosive or atmospheric conditions, finish shall be as approved by Engineer.
- F. Owner shall not be responsible for material and equipment prior to testing and acceptance.

3.4 BULLETINS, MANUALS, AND INSTRUCTIONS

- A. Obtain at time of purchase of equipment, three copies of operation, lubrication and maintenance manuals for all items.
 1. Assemble literature in coordinated manuals with additional information describing

- combined operation of field-assembled units, including as-built wiring diagrams.
 2. Manual shall contain names and addresses of manufacturers and local representatives who stock or furnish repair parts for items or equipment.
 3. Furnish three copies of manuals to Engineer for approval and distribution to Owner. Deliver manuals no less than 30 days prior to acceptance of equipment to permit Owner's personnel to become familiar with equipment and operation prior to acceptance.
- B. Operating instructions: Upon completion of installation or when Owner accepts portions of building and equipment for operational use, instruct Owner's operating personnel in any or all parts of various systems.
1. Such instructions shall cover periods of control such as will take Mechanical equipment through complete cycle.
 2. Make adjustments under actual operating condition. Provide a minimum of three separate training sessions, each of up to one day's duration.
- C. Do not interrupt existing or temporary services without Owner's approval and coordination with the GC.
- D. Schedule interruptions in advance, according to Owner's instructions. Submit, in writing, with request for interruption, methods proposed to minimize the length of interruption.
- E. Interruptions shall be scheduled at such times of the day and work so that they have minimal impact on Owner's operations.
- F. Perform work required so as to provide proper access to material or equipment, which may need inspection, replacement, repair or service.
1. If proper access cannot be provided, confer with Engineer as to best method of approach to minimize effect of reduced access, which may result.

3.5 ADJUSTING

- A. Provide start-up service, make any required adjustments and efficiency tests, and provide one, minimum three-hour instruction periods to owner's representative at the site.
1. This is in addition to the separately specified control system training.
- B. Include a minimum of one additional visit to the site after substantial completion for the purpose of assisting the Owner's representatives in proper operation.

3.6 PIPING AND FITTINGS

- A. Install piping as required for a complete installation. Conform to the best practice of the trade.

1. See drawings for correct pipe sizing and locations.
2. Pipe materials and fitting materials shall be as indicated in Schedule of Pipe and Fitting Materials.
3. Install all piping and fittings per Manufacturer specific requirements.
4. Refrigerant Piping Pressure Test Requirements
 - a. Pressure test all refrigerant piping systems with compressed air method for pipe testing or as required per Manufacturer.
 - b. Pressure test shall maintain the Manufacturer's required pressure rating for a minimum of 48 hrs. Use stop valves where required.

- B. Provide shut-offs at each major piece of equipment and at appropriate locations to facilitate service of components.
- C. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Install valves with stems upright or horizontal, not inverted.
- E. Install unions at equipment that does not have flanged connections between equipment and isolation valves.

3.7 PREVENTATIVE MAINTENANCE

- A. Contractor shall provide preventive maintenance of all new equipment through the duration of the construction period and warranty period. Any equipment or products which are used, during the construction period, to provide heating or ventilation shall be maintained at this contractor's expense.
- B. Prior to starting any equipment the contractor shall provide a detailed plan indicating how the equipment will be maintained. At a minimum the plan shall include the following:
 1. Itemized list of maintenance which needs to be performed.
 2. Frequency of when each task shall be performed.
- C. When each preventive maintenance task is performed contractor shall provide written documentation proving completion of the task. Documentation shall be submitted to the owner for review and documentation.

3.8 PIPE INSULATION INSTALLATION

- A. General Installation Requirements
 1. Insulation shall be installed by insulation firm regularly specializing in this work and employing men particularly skilled therein. (No covering applied by pipe fitters or helpers will be acceptable.) All materials shall be installed in strict accordance with manufacturer's recommendations, building codes, and industry standards.

2. Install insulation materials only after piping has been inspected, tested and approved.
3. All pipes, valves, fittings, flanges, and similar elements shall be insulated.
4. Locate insulation and cover seams in the least visible location. All surface finishes shall be extended to protect all surfaces, ends and raw edges of insulation, ends or raw edges of insulation terminations at equipment connections, or fittings shall be sealed with vapor retarder mastic.
5. All pipe insulation shall be continuous through walls, ceiling or floor openings, or sleeves.
6. Install per manufacturers recommended installation instructions.

B. General Installation Requirements for flexible foam Insulation

1. All insulation ends must be firmly butted to eliminate all voids and secured with appropriate butt-seam adhesive.
2. Seal longitudinal seam with appropriate adhesive.
3. Allow a minimum of 36 hours before system operation to allow for adhesive to fully cure.
4. Fabricate fitting covers for valves, elbows, tees, etc from miter-cut pieces of insulation. Fitting cover should overlap the pipe insulation by at least one inch.
5. Install per manufacturers installation instructions.

C. Heat Pump and DX Cooling Systems

1. All insulation shall be flexible foam except where noted otherwise.
2. For heat pump systems insulate both liquid and suction piping.
3. For cooling only systems insulate suction piping only.

D. Air Conditioning Condensate Systems

1. All insulation shall be Fiberglass except where noted otherwise.

3.9 JOINTS AND CONNECTIONS

- A. Joints and connections shall be permanent and shall be gas-and water-tight. Jointing shall be types specified for service indicated. Joints and connections shall meet requirements of manufacturers best recommended practice. All transitions between different piping materials shall be made using approved adapters. Adapters for transitions between two types of piping materials shall be manufactured for purpose intended.

3.10 EXPANSION PROVISIONS

- A. Installation of piping must allow for expansion using offsets, loops, swing joints, expansion joints, etc. as shown and as necessary to prevent undue strain.
1. Take-offs from mains to runouts shall not have less than three elbow swings.
- B. Mains and risers with loops or offsets shall be securely anchored to structure so as to

impart expansion towards loops or offsets.

1. Anchors shall be constructed of heavy forged wrought iron, secured to pipe and to structure.
 2. Provide vibration isolation as required.
- C. Provide pipe alignment guides as required to guide expanding pipe to move freely from anchor points toward expansion joints, offsets, etc.

3.11 TESTING, INSPECTION, BALANCING AND ADJUSTMENT

A. General

1. Provide the services of an independent test and balance company certified by the ABA who shall supply qualified personnel, equipment, apparatus and services for testing, inspection, balancing and adjusting of Mechanical systems, to performance data shown in schedules, as specified, and as required by codes, standards, regulations and authorities having jurisdiction including City Inspectors, Owner and Engineer.
 - a. Notify Engineer and involved authorities at least 48 hours prior to testing or inspection.
 - b. Do not cover work (this includes application of insulation) prior to testing or inspection.
2. Testing, inspection, balancing and adjusting shall in no way relieve or reduce guarantee requirements.
3. The Mechanical systems are not to be considered substantially complete until the test and balance work is complete and the submitted paper work detailing results has been approved by the engineer.
4. Submit proposed test procedures, recording forms and test equipment for review prior to testing and balancing.
5. Notify Engineer and authorities involved at least 48 hours prior to testing.
6. Do not cover or conceal work prior to testing and inspection and obtaining approval.
7. Prior to date of acceptance, furnish Engineer with certificates of testing and inspection for Mechanical systems indicating approval of authorities having jurisdiction and conformance with requirements of Contract Documents.
 - a. Instruments used for testing and balancing shall have been calibrated six months prior to testing or balancing.
 - b. Calibration shall be certified.
8. Leaks, damage and defects discovered or resulting from tests shall be repaired or replaced to like-new condition with acceptable materials.
 - a. Tests shall be continued until system operates without adjustments or repairs.
9. Report on standard reporting forms.

10. Submit one digital copy of testing and balancing reports to Engineer for approval.
11. Prove capacity and performance of equipment by field testing. Install equipment and instruments required for testing, thermo-wells and gauge connections at no additional cost to Owner.
12. Qualified representative of equipment manufacturer shall be present at test.
13. Tests: No tests shall be started until systems have been flushed and filled per specifications.
 - a. Provide temporary piping and connections for testing, flushing, or draining systems to be tested.
 - b. If leaks develop, repairs shall be made and tests repeated.
 - c. Tests shall be continued until systems operate without adjustments and repair to equipment or piping.
 - d. Tests are further specified under other paragraphs of this Section.

B. Test of heat pumps

1. Measure air quantities at all inlets and outlets.
2. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
3. Measure static air pressure conditions at AHU's, including filter and coil pressure drops, and total pressure across the fan.
 - a. Make allowance for 50 percent loaded filter.
4. Adjust outside air automatic dampers, outside air, return air, and exhaust air dampers for design conditions.

3.12 TRAINING

- A. Upon completion of installation or when Owner accepts portions of building and equipment for operational use, instruct Owner's operating personnel in any or all parts of various systems.
- B. Systems must be complete and fully functional before providing training and instruction to Owner's personnel.

END OF SECTION 230000

SECTION 26 00 00

GENERAL REQUIREMENTS FOR ELECTRICAL WORK

Part One: General

1.1 General Requirements

1.1.1 Definition of Work

Conditions of the Contract, Specifications, Change Orders, Addenda and Drawings apply to work of this section.

1.1.2 Provisions

As used in this section, "provide" means "furnish and install", "furnish" means "to purchase and deliver to the project site complete with every necessary appurtenance and support and to store in a secure area in accordance with manufacturers instructions", and "install" means "to unload at the delivery point at the site or retrieve from storage, move to point of installation and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project".

1.1.3 Existing Site Conditions – Responsibilities Prior to Bid

Before submitting a bid, the Electrical Subcontractor shall visit and carefully examine site to identify existing conditions and difficulties that may affect the work of this Section. No extra payment will be allowed for additional work caused by unfamiliarity with site conditions.

1.1.4 Existing Site Conditions – Responsibilities Prior to Starting Work

Before starting work in a particular area of the project, the Electrical Subcontractor shall examine the conditions under which work must be performed including preparatory work performed under other Sections of the Contract, or by the Owner and report conditions which might adversely affect the work in writing to the Engineer. Do not proceed with work until defects have been corrected and conditions are satisfactory. Commencement of work shall be construed as complete acceptance of existing conditions and preparatory work.

1.2 Applicable Codes and Standards

1.2.1 Work

All work shall be in accordance with the laws, rules, codes, and regulations set forth by Local, State, and Federal authorities having jurisdiction. All products and materials shall be manufactured, installed and tested as specified, but not limited to the latest accepted edition of the following codes, standards and regulations:

NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Act
NEC	National Electrical Code (NFPA 70)
UL	Underwriters Laboratory
NESC	National Electrical Safety Code
FM	Factory Mutual Association
MUBEC	Maine Uniform Building Code
Local AHJ	Local and State building, electrical, fire and health department and public

	safety codes agencies.
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1.2.2 Code Conflicts

When requirements cited in this Paragraph conflict with each other or with Contract Documents, the most stringent requirements shall govern conduct of work. The Engineer may relax this requirement when such relaxation does not violate the ruling of authorities that have jurisdiction. Approval for such relaxation shall be obtained in writing. Should the Electrical Subcontractor perform any work that does not comply with the requirements of the applicable building codes, state laws, and industry standards, he shall bear all costs arising in correcting these deficiencies.

1.3 Contract Documents

1.3.1 Work to be Provided

Work to be provided under this division is shown on the electrical drawings listed in Division 1, General Requirements and in these Contract Specifications.

1.3.2 Coordination of Work

The listing of electrical drawings does not limit the responsibility of determining the full extent of work that is required by these contract documents. The Electrical Subcontractor shall refer to the drawings and other specification sections included in the complete Contract Package, that indicate types of construction with which work of this section must be coordinated. The General Contractor shall coordinate the work of all trades including that of the electrical contractor, with all other subcontractors to determine whether there will be any interference with the electrical work. If the Electrical Subcontractor fails to check with the General Contractor and the electrical work is later found to interfere with the work of other subcontractors, then he shall make necessary changes, without additional cost to the Owner, to eliminate such interference.

1.3.3 Intent of Design

Drawings are diagrammatic and indicate the general arrangement of systems and work to be included in the Contract. Information and components shown on riser diagrams or called for in the specifications but not shown on plans, and vice versa, shall apply and shall be provided as though required expressly by both. The contract documents are not intended to indicate and specify each component required, but do require that the components and materials be provided for a complete and operational installation.

1.3.4 Discrepancies in Documents

Each bidder shall be responsible for examining the drawings and specifications carefully before submitting his bid, with particular attention to errors, omissions, conflicts with provisions of laws and codes imposed by authorities having jurisdiction, conflicts between portions of drawings, or between drawings and specifications, and ambiguous definition of the extent of coverage in the contract. Any such discrepancy discovered shall be brought to the immediate attention of the Engineer for correction. Should any of the aforementioned errors, omissions, conflicts or ambiguities exist in either or both the drawings and specifications, the Electrical Subcontractor shall have the same explained and adjusted in writing before signing the contract or proceeding with work. Failure to notify the Engineer in writing of such irregularities prior to signing the Contract will cause the Engineer's interpretation of the Contract Documents to be final. No additional compensation will be approved because of discrepancies thus resolved.

1.3.5 Conflicts with Codes and Regulations

The drawings and these specifications are intended to comply with all the abovementioned Codes, Rules and Regulations. If discrepancies occur, the Electrical Subcontractor shall immediately notify

the Engineer in writing of said discrepancies and apply for an interpretation and, unless and interpretation is offered in writing by the Engineer prior to the execution of the contract, the applicable rules and regulations shall be complied with as a part of the contract.

Part Two: Scope of Work

2.1 General Requirements

2.1.1 General Scope

The work to be accomplished under these specifications includes providing all labor, materials, equipment, consumable items, supervision, administrative tasks, tests and documentation required to install complete and fully operational electrical systems as described herein and shown on the Drawings.

2.1.2 Administrative Responsibilities

The Electrical Subcontractor shall file plans, obtain permits and licenses, pay fees and obtain necessary inspections and approvals from authorities that have jurisdiction, as required to perform work in accordance with all legal requirements.

2.1.3 Coordination with Local Utility Companies

The Electrical Subcontractor shall coordinate with the local Power, Telephone, and Cable System Utilities. The Electrical Subcontractor shall perform all work in accordance with utility company requirements.

2.2 Work to be Provided Under this Division

2.2.1 General Scope

The Work shall be complete from point of service to each outlet or device with all accessory construction and materials required to make each item of equipment or system complete and ready for operation. The work shall include but not be limited to the following. The Electrical Subcontractor shall provide:

- A. Service Entrance:** Furnish all secondary service duct banks and conductors from the new pad mounted transformers to main disconnect switch. Coordinate all work with the local Utility (Central Maine Power) and furnish all materials and equipment in compliance with their requirements. **Please note that the Owner is to have the existing Primary Electrical System replaced with new primary conduits, wires, and transformer pads. While this is not part of the scope of this project, the Electrical Contractor shall be responsible for running service conduits and conductors from the buildings to the new transformer locations.**
- B. Utility Metering:** Furnish metering equipment as shown on the plans.
- C. Grounding System:** Provide a complete grounding system for each building and all equipment and interconnection wiring.
- D. Temporary Power:** Any and all charges (if required) for having temporary service provided to the facility, and all equipment, wiring and lighting as required and defined later in this specification section.
- E. Service Entrances for Other Utilities:** Furnish new service conduits from the new pole to the existing underground facilities to the building for telephone and CATV. **Please note that the**

Owner is to have the existing underground Telephone and CATV Distribution System replaced with new conduits wiring and handholes. While this is not part of the scope of this project, the Electrical Contractor shall be responsible for running service conduits and conductors from the buildings to the handhole locations as determined by the utility.

- F. **Power Distribution Systems:** Provide power and lighting distribution systems including service panelboards, overcurrent devices, raceway, cable and wire as required and shown on the drawings.
- G. **Feeder and Branch Circuit Wiring:** Provide feeder and branch circuits and devices for power to equipment and convenience receptacles. This includes branch wiring to system control panels furnished under other sections.
- H. **Motor Circuit Wiring:** Provide all motor wiring, safety disconnects, and motor starters unless integral with equipment.
- I. **Lighting Systems:** Provide complete interior and exterior lighting system including normal and emergency fixtures, lamps, controls, trim and accessories.
- J. **Telephone and Data Systems:**
Provide conduits, device boxes, conduits and cables to locations specified for final equipment and punch down in the OIT by the Owner (Gate House only).
- K. **Security Systems:**
Provide conduits, device boxes, cameras, enclosures and cables for connection to camera system equipment headend equipment in the OIT (Gate House only).
- L. **Control Wiring:** Provide control wiring not provided by Division 230000.
- M. **Supports and Fittings:** Provide all support material and hardware for raceway, cable tray and electrical equipment.
- N. **Terminations:** Provide terminations of all cable and wire unless otherwise noted.
- O. **Penetrations:** Provide all building wall, floor and roof penetrations for raceway where not provided by the General Contractor.
- P. **Other Items Furnished By Others:** Install the following equipment furnished by others:
 - 1. Motors
 - 2. Control Panels

2.3 Work not Included Under this
Division

2.3.1 Related Work Included in Other Sections

The following work is not included in this Section and shall be performed under other sections:

- A. Excavation and backfill.
- B. Concrete work, including concrete housekeeping pads and other pads and blocks for vibrating and rotating equipment.
- C. Cutting and patching of masonry, concrete, tile, and other parts of structure, with the exception of drilling for hangers and providing holes and openings in metal decks. The Electrical Subcontractor shall identify locations of penetrations, excavations, structural supports, etc. required for the completion of the Work of this Section to the General Contractor in a timely manner.
- D. Installation of access panels in ceilings and wall construction.
- E. Painting, except as specified herein.
- F. Temporary water, heat, gas and sanitary facilities for use during construction and testing.
- G. Outdoor air intake or exhaust louvers.
- H. Control wiring specifically indicated as part of Division 23.

2.4 General Equipment and Materials Requirements

2.4.1 General Requirements

All equipment and materials shall be new and of the quality specified. All materials shall be free from defects at the time of installation. Materials or equipment damaged in shipment or otherwise damaged during construction shall not be repaired at the jobsite but shall be replaced with new materials.

2.4.2 Representation of Equipment

All equipment installed on this project shall have local representation, local factory authorized service and a local stock of repair parts.

2.4.3 Warranties

No equipment or material shall be installed in such a manner as to void a manufacturer's warranty. The Electrical Subcontractor shall notify the Engineer of any discrepancies between the Contract Documents and manufacturer's recommendations prior to execution of the work. Refer to Division 1, General Requirements for Warranty Requirements.

2.5 Shop Drawings

2.5.1 General Requirements

After the Contract is awarded, but prior to proceeding with the Work, the Electrical Subcontractor shall obtain complete shop drawings, product data and samples from manufacturers, suppliers, vendors, and Subcontractors for all materials and equipment specified herein, and submit data and details of such materials and equipment for review by the Engineer. Submission of such items shall follow the

guidelines set in the General Section of the Specification Document. Prior to submission of the shop drawings, product data and samples to the Engineer, the Electrical Subcontractor shall review and certify that the shop drawings, product data and samples are in compliance with the Contract Documents. Further, the Electrical Subcontractor shall check all materials and equipment after their arrival on the jobsite and verify their compliance with the Contract Documents. A minimum period of ten working days, exclusive of transmittal time will be required in the Engineer's office each time shop drawings, product data and/or samples are submitted or resubmitted for review. This time period shall be considered by the Electrical Subcontractor when scheduling his Work.

2.5.2 Information to be included in Submittal

The shop drawing submittal shall include all data necessary for interpretation as well as manufacturer's name and catalog number. Sizes, capacities, colors, etc., specified on the drawings shall be specifically noted or marked on the shop drawings.

2.5.3 Information Not to be included in Submittal

Submittals shall contain only information specific to systems, equipment and materials required by Contract Documents for this Project. Do not submit catalogs that describe products, models, options or accessories, other than those required, unless irrelevant information is marked out or unless relevant information is highlighted clearly. Marks on submittals, whether by Contractor, Subcontractor, manufacturer, etc., shall not be made in red ink. Red is reserved for review process.

2.5.4 Responsibility of Submitted Equipment

The Engineer's review of such drawings shall not relieve the Subcontractor of responsibility for deviations from the Contract, Drawings or Specifications, unless he has in writing called the attention of the Engineer to such deviations at the time of the submission. The Engineer's review shall not relieve the Electrical Subcontractor from responsibility for errors or omissions in such drawings.

2.5.5 Proposal of Other Equipment

If the Electrical Subcontractor proposes an item of equipment other than that specified or detailed on the drawings which requires any redesign of the wiring or any other part of the mechanical, electrical or architectural layout, the required changes shall be made at the expense of the trade furnishing the changed equipment at no cost to the Owner.

2.5.6 Substitution of Equipment of Equal Quality

Manufacturer's names are listed herein and on the drawings to establish a standard for quality and design. Where one manufacturer's name is mentioned, products of other manufacturers will be acceptable if, in the opinion of the Engineer the substitute material is of quality equal to or better than that of the material specified. Where two or more manufacturer's names are specified, material shall be by one of the named manufacturers only.

2.6 Equipment Manuals

2.6.1 General Requirements

The Electrical Subcontractor shall provide three copies of operations and maintenance manuals for all items. These manuals shall be packaged with additional information including equipment cur sheets and as-built wiring diagrams. Manuals shall contain names and addresses of manufacturers and local representatives who stock or furnish repair parts for items or equipment.

2.6.2 Schedule

Deliver manuals no less than 30 days prior to acceptance of equipment to permit Owner's personnel to become familiar with equipment and operation prior to acceptance.

2.6.3 Instruction of Owner's Operating Personnel

Upon completion of installation or when Owner accepts portions of building and equipment for operational use, instruct the Owner's operating personnel in any and all parts of various systems. Such instructions shall cover period of control such as will take mechanical equipment through complete cycle. Make adjustments under actual operating conditions.

2.7 Record Drawings

2.7.1 General Requirements

As work progresses, and for duration of the Contract, the Electrical Subcontractor shall maintain a complete and separate set of prints of Contract Drawings at job site at all times and record work completed and all changes from original Contract. Drawings shall clearly and accurately include work installed as a modification or added to the original design. At completion of work and prior to final request for payment, the Electrical Subcontractor shall submit a complete set of reproducible record drawings showing all systems as actually installed.

Part Three: Execution

3.1 Wiring Methods

3.1.1 Requirements

Unless otherwise noted all wiring shall be installed in raceway as follows:

- A. **Power Distribution Outdoors:** All conduit installed outdoors, all risers through the slab, and conduit exposed to physical damage shall be rigid steel, rigid aluminum or intermediate metal conduit. Wiring installed underground shall be installed in rigid non-metallic, PVC conduit and as per the Contract Drawings.
- B. **Power Distribution Indoors:** Unless otherwise noted, all exposed power distribution wiring shall be installed in electrical metallic tubing (EMT). Concealed indoor wiring including feeders and branch circuits shall be allowed to be furnished in properly supported MC cable assembly.
- C. **Telephone & Data:** Telephone and Data wiring shall be furnished in 3/4" minimum ENT conduits from devices identified on the plans in spaces between walls and inaccessible ceilings.
- D. **Security Systems Wiring:** Security wiring shall be furnished in 3/4" minimum ENT conduits from devices identified on the plans in spaces between walls and inaccessible ceilings.
- E. **Underslab Conduits:** Conduit installed under floor slabs shall be rigid nonmetallic conduit with rigid steel stubups.

3.1.2 Underground Wiring Methods

- A. All service entrance conductors and other conduits indicated on the Drawings shall be Concrete encased PVC conduits where under areas subject to traffic. Conduits encased in concrete can be provided type EB-20 minimum, or as required by the local Power Company. PVC Conduit spacers shall be used in compliance with the manufacturer's recommendations to insure proper spacing as detailed in the duct bank sections of the Contract Drawings.
- B. Wiring under 600 volts, including site lighting branch circuits and other conduits not required to be concrete encased shall be in direct buried Schedule 40 PVC conduits.
- C. Conduit installed in or below floor slabs shall be PVC with rigid steel stub-ups.

3.2 Equipment Arrangement and Access

3.2.1 Location of Equipment

Locate all equipment which must be serviced, operated or maintained in fully accessible positions. Minor deviations from the drawings may be made to allow for better accessibility at no additional cost to the Owner, but changes shall not be made without review by the Engineer. Minimum clearances in front of or around equipment shall conform to the latest applicable code requirements.

3.2.2 Arrangement of Equipment

The size of equipment shown on the drawings is based on the dimensions of a particular manufacturer. Where other manufacturers are acceptable, it is the responsibility of the Electrical Subcontractor to determine if the equipment he proposed to furnish will fit the space available. Layout drawings shall be prepared by the Subcontractor when required by the Engineer or Owner to indicate a suitable arrangement.

3.3 Equipment Labeling

3.3.1 Panelboards

All panelboards, cabinets and other specified equipment shall be labeled with engraved laminated plastic plates, minimum 3/4" high with 3/8" engraved letters. Punch tapes with mastic backings are not acceptable.

3.3.2 Starters and Disconnect Switches

All starters, disconnect switches and other specified equipment shall be marked with engraved laminated plastic plates, minimum 1/2" high with 1/4" engraved letters. Where individual switches or circuit breakers in power or distribution panelboards do not have cardholders, they shall be marked with 1/2" high labels.

3.3.3 Empty Conduits

All empty conduits shall have labels tied to the pull string at each end of each empty conduit, marked as to identification of each end. Junction boxes with circuits provided for future use shall be labeled with appropriate circuit designation.

3.3.4 Panelboard Directories

Cardholders for panelboards shall be filled out with typewritten identification of each circuit, except that the word "spare" shall be written in soft pencil to identify all circuit breakers installed that are not used.

3.4 Temporary Light and Power

3.4.1 Requirements

The Electrical Subcontractor shall provide a temporary service to the new construction area as required to provide electric light and power while the building is under construction and until the permanent feeders have been installed, tested and accepted by the Owner. Install and maintain a feeder or feeders of sufficient capacity for the requirements of each area. The Electrical Subcontractor shall furnish, install and remove the temporary electrical power and lighting systems and pay for all labor, materials, and equipment required therefore. All such temporary electrical work shall meet the requirements of the National Electrical Code, the local utility company, and OSHA.

3.4.2 Payment of Electric Bills

The General Contractor shall pay the costs of all energy consumed by himself and by all of his subcontractors until final completion.

3.4.3 Temporary Lighting

The Electrical Subcontractor shall furnish all lamps, both initial and replacement, used for the temporary lighting system.

3.4.4 Equipment Provided by Others

The General Contractor and all subcontractors, individually, shall furnish all extension cords, portable lights and lamps therefore, sockets, motors, and accessories as required for their work.

3.4.5 Reimbursable Items

The General Contractor and all subcontractors shall reimburse the Electrical Subcontractor for the following:

- A. Any temporary wiring of a special nature, other than that specified above, required for their work.
- B. Any temporary wiring of construction offices and buildings used by them, other than the office of the General Contractor and the Clerk of the Works.

3.4.6 Removal of Equipment and Wiring

All temporary wiring, service equipment, and accessories thereto shall be removed by the Electrical Subcontractor when directed by the General Contractor.

END OF SECTION 26 00 00

SECTION 26 05 19

600 VOLT WIRE

Part One: General

1.1 General Requirements

1.1.1 Provisions

The provisions of Section 26 00 00, General Requirements for Electrical Work apply to the work of this section.

1.2 Applicable Codes and Standards

1.2.1 Products

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

ASTM B-3	Soft or Annealed Copper Wire
ASTM B-8	Concentric Lay Stranded Copper Conductors
NEMA WC-5	Thermoplastic Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
NEMA WC-7	Cross-Linked Thermosetting Polyethylene Insulated Wire for the Transmission and Distribution of Electrical Energy
UL 44	Rubber Insulated Wires and Cables
UL 62	Flexible Cord and Fixture Wire
UL 83	Thermoplastic Insulated Wires and Cables

1.3 Submittals Required

1.3.1 Data Sheets

Manufacturer's product data sheets.

1.4 Manufacturers

Subject to compliance with the Specification Requirements:

- Anixter
- General Cable
- Rome Cable
- Approved Equal

Part Two: Products

2.1 General

2.1.1 Conductors

All conductors shall be annealed copper in accordance with ASTM B-3.

2.1.2 Jacket

The jacket of all wire shall be printed with the following information:

- Manufacturer
- Size
- Insulation type
- Maximum voltage
- UL label

2.1.3 Insulation

All insulation shall be rated 600 for volts.

2.2 Power Wiring

2.2.1 Feeders and Motor Branch Circuits

Feeders and motor branch circuits shall be type THHN/THWN.

2.2.2 Description

All power wiring shall be stranded, Class B strand in accordance with ASTM B-8, minimum size #12 AWG.

2.3 Lighting and Receptacle Branch Circuits

2.3.1 Description

All lighting and convenience receptacle branch circuit wiring shall be in type MC cable assemblies, minimum size #12 AWG.

2.4 Control Wiring

2.4.1 Description

Wiring for control circuits shall be THHN/THWN stranded, with Class B strand in accordance with ASTM B-8, minimum size #14 AWG.

2.5 Fixture Wire

2.5.1 Description

Where high temperature fixture wire is required, it shall be furnished as silicone rubber type SF-2.

Part Three: Execution

3.1 General

3.1.1 Installation

All wire shall be installed in accordance with Section 26 00 00, Part 3.1 Wiring Methods.

END OF SECTION 26 05 19

SECTION 26 05 26
GROUNDING EQUIPMENT

PART ONE: GENERAL

1.1 GENERAL REQUIREMENTS

A. Provisions

The provisions of Section 26 00 00, General Requirements for Electrical Work apply to the work of this section.

B. Installation Compliance

The intent of design is to furnish a complete, new, grounding electrode system, and bond all systems as required by the National Electrical Code (NEC). Contractor shall provide any additional equipment including grounding electrodes, electrode conductors, bonding jumpers, equipment grounding conductors, connections and other materials as may be required to form a complete grounding system meeting current requirements. The completed system provided shall meet the requirements of the NEC and the interpretation of the Local Authority Having Jurisdiction.

1.2 APPLICABLE CODES AND STANDARDS

A. Products

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

NFPA 70	National Electrical Code
UL 467	Grounding and Bonding Equipment

1.3 SUBMITTALS REQUIRED

A. Equipment Data Sheets

Data sheets for chemical grounding systems, exothermal connection methods, and associated wiring as required.

1.4 MANUFACTURERS

A. Products shall be of firms regularly engaged in the manufacture of grounding equipment.

PART TWO: PRODUCTS

2.1 GENERAL

A. Requirements

Provide all equipment, components and parts required for a complete and operable system.

2.2 GROUND RODS

A. Requirements

Ground rods shall be ¾-inch copper clad steel construction furnished in 10-foot lengths.

2.3 CONDUCTORS

A. Bare Grounding Conductors

Bare grounding conductors shall be soft drawn stranded copper, sized in accordance with NEC Article 250 unless otherwise noted on the Drawings.

B. Insulated Grounding Conductors

Insulated grounding conductors shall be stranded copper with Type TW, THW or THHN/THWN insulation. Grounding conductor shall be provided with green insulation for identification purposes.

2.4 CONNECTIONS

A. Welded Connections

Welded connections shall be exothermic reaction type, as manufactured by Cadweld, or approved equal. The contractor shall provide all molds, crucibles, weld metal, and any necessary materials or equipment required to make connections using this process.

B. Compression Connections

Compression lugs shall be short barrel, one-hole compression type for conductors #2/0 AWG and smaller and long barrel, two-hole compression type for conductors #3/0 AWG and larger.

PART THREE: EXECUTION

3.1 GROUNDING ELECTRODE SYSTEM

A. Requirements

Grounding electrodes of the types shown on the Contract Drawings and as required by NEC shall be provided. Additional electrodes shall be provided if required by the local Authority Having Jurisdiction. All electrodes shall be bonded together to form the grounding electrode system.

B. Installation of Ground Rods

Ground rods shall be driven vertically with the upper end of the rod not less than 2-1/2 feet below finished grade. When conditions require, ground rods may be driven at an angle not to exceed 45 degrees from vertical, with the driven end facing outside of the grounding ring.

C. Installation of Grounding Ring Conductors

Grounding ring conductors shall be bare copper, sized as shown on the Contract Drawings and installed at a minimum depth of 2-1/2 feet below finished grade. Conductors encased in concrete footings, in or under floor slabs, and in duct banks shall be bare copper, sized as shown on the Contract Drawings. All connections made below grade or encased in concrete shall be exothermic weld type.

D. Connection to Structural Steel

Grounding grid conductors shall be connected to building structural steel as required by the NEC this shall include a connection to reinforcing steel in a minimum of one concrete footing of the new addition. All connections to building steel shall be exothermic weld type.

E. Grounding Electrode Conductors

The electrical service and all separately derived systems shall be grounded in accordance with NEC Article 250. The grounding electrode conductor shall be copper, sized in accordance with Article 250 of the NEC or as shown on the Drawings.

3.2 EQUIPMENT GROUNDING SYSTEMS

A. Requirements

A separate, insulated copper conductor, with green colored insulation, shall be provided in all raceways and with every feeder, branch and control circuit, in addition to the grounded metallic conduit system. The equipment grounding conductor shall be grounded at both ends.

B. Connection of Equipment Grounding Conductors

Connections to equipment grounding busses shall use compression type termination lugs bolted to a clean, dry surface on the bus, free from any contaminants which may hinder the electrical continuity of the connection. The contractor shall provide any additional hardware and all drilling and tapping that may be required for this connection.

3.3 ADDITIONAL BONDING REQUIREMENTS

A. Grounding of Raceway Systems

All metallic raceways shall be electrically continuous and bonded to the grounding system.

B. Bonding of Other Systems

Interior metal water piping shall be bonded as required by Article 250 of the NEC. The points of attachment of these bonding conductors shall be located in readily accessible locations.

END OF SECTION 26 05 26

SECTION 26 05 33

RACEWAY AND FITTINGS

PART ONE: GENERAL

1.1 GENERAL REQUIREMENTS

A. Provisions

Provisions of Section 26 00 00, General Requirements for Electrical Work apply to the work of this Section.

1.2 APPLICABLE CODES AND STANDARDS

A. Products

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

ANSI C80.1	Standard for Rigid Steel Conduit
ANSI C80.3	Standard for Electrical Metallic Tubing
ANSI C80.6	Standard for Intermediate Metal Conduit
UL 1	Flexible Metal Conduit
UL 6	Rigid Metal Conduit
UL 360	Liquid Tight Flexible Steel Conduit
UL 514B	Fittings for Conduit and Outlet Boxes
UL797	Electrical Metallic Tubing
UL870	Wireways, Auxilliary Gutters and Associated Fittings
UL1242	Intermediate Metal Conduit

1.3 SUBMITTALS REQUIRED

A. Manufacturers' product data sheets

1.4 MANUFACTURERS

A. In compliance with the Specification Requirements:

- Allied Tube and Conduit (Conduit)
- Wheatland (Conduit)
- Thomas and Betts (Fittings)
- Appleton (Fittings)
- Crouse Hinds/Cooper (Fittings)
- OZ Gedney (Fittings)
- Killark (Fittings)
- AFC Cable Systems (MC/LFMC)
- Southwire (MC/LFMC)
- Other manufacturers listed in the specification descriptions

- Approved equals

PART TWO: PRODUCTS

2.1 CONDUIT

A. Galvanized Rigid Steel Conduit (GRS)

Rigid steel conduit shall be manufactured from mild steel tube with a uniform protective coating of hot dipped zinc galvanizing inside and outside, including all threads. The conduit shall be furnished in nominal 10-foot lengths, with both ends threaded and furnished with a galvanized coupling on one end and a plastic thread protector on the other end.

B. Rigid Aluminium Conduit

Rigid aluminum conduit, couplings and elbows shall be manufactured of a suitable copper-free aluminum alloy. Conduit lengths shall be seamless throughout and shall have hard, smooth and gum-free interior coatings to facilitate the pulling-in of conductors. It shall be furnished in nominal 10-foot lengths, with both ends threaded and a coupling applied to one end of each length. Threads on the coupling end shall be coated with a special lubricant so that the coupling may be removed without difficulty. Threads on the end opposite the coupling shall be protected from damaged by a plastic cap.

C. Intermediate Metal Conduit (IMC)

Intermediate metal conduit shall be of steel piping with a uniform protective coating of hot dipped zinc galvanizing on the outside of the conduit, including all threads. The conduit shall be furnished in nominal 10-foot lengths, both ends threaded furnished with a galvanized coupling on one end and a plastic thread protector on the other end.

D. Electrical Metallic Tubing (EMT)

Electrical metallic tubing shall be constructed of zinc coated steel with an interior coating of lacquer or enamel to permit easier wire pulling.

E. Liquid Tight Flexible Metal Conduit (LFMC)

Liquid tight flexible conduit shall be constructed with a flexible core of galvanized steel and an oil and sunlight resistant PVC jacket to form a liquid tight raceway. The overall jacket shall be wrinklefree and suitable for use in temperatures from -25°C to +80°C.

F. Flexible Metal Conduit (MC)

Flexible metal conduit shall have an outer armor constructed of be hot dipped galvanized interlocked strip steel.

2.2 CONDUIT FITTINGS

A. Bushings

1. Insulated Bushings

Insulated bushings for conduit sizes 1-1/4 inches and larger shall have metal bodies and threads, with molded-on high impact phenolic thermosetting insulation to prevent conductor insulation damage. Bushings shall be Type "IBC" insulated bushings as manufactured by OZ

Gedney or an approved equal. Insulated bushings for conduit sizes 1 inch and smaller may be of plastic, OZ Gedney Type "A", or an approved equal.

2. Insulated Grounding Bushings

Insulated grounding bushings shall be similar to the insulated bushings described above, except they shall have set screws to lock the bushings on the conduits and shall have mechanical type lugs attached. The lugs shall be sized to accept the ground wire sizes as set forth in the latest edition of the National Electrical Code, but in no case smaller than No. 8 AWG wire. Grounding bushings shall be Type "BLG" as manufactured by OZ Gedney or an approved equal.

3. Male Bushings

Male bushings shall be Thomas and Betts Corporation insulated throat chase nipples, or a product of equal construction. Bushings used only to pass conductors through metal partitions, etc. shall be OZ Gedney, Type "ABB".

4. Male Bushings

Bushings for use with EMT shall be OZ Gedney type "SBT" or approved equals.

B. Conduit Bodies

Conduit bodies for use with aluminum conduit shall be of copper free aluminum alloy. Those for use with steel conduit may be of galvanized, or cadmium plated cast iron, or of copper free aluminum alloy. All conduit fittings shall be provided with neoprene gaskets and sheet metal covers, except that cast covers shall be used for sized 1-1/2 inches and larger. Rigid conduit connections shall be threaded and EMT connections shall be set screw type. Cover screws shall be captive. All conduit fittings shall be as manufactured by Crouse Hinds, Appleton, Killark or approved equal.

C. Hubs

Water-tight conduit connections are required on all NEMA 3R, 4, and 4X enclosures and all electrical equipment located outdoors or in damp or wet areas. Where hubs or water-tight threaded connections are not provided as part of the enclosure, water-tight hubs shall be Myers "Scrutite", or approved equal. All other terminations shall be double locknut and bushing.

D. Fittings

Fittings for use with liquid-tight flexible conduit shall be zinc plated malleable iron Crouse Hinds type "CGB" or approved equal.

E. Locknuts

Locknuts shall be hot dipped galvanized steel or malleable iron. Standard locknuts shall be used for connections to NEMA 1 enclosures. Sealing locknuts with integral gasket shall be used for connections to NEMA 12 enclosures.

2.3 JUNCTION BOXES

A. Pull and Junction Boxes

Pull and junction boxes shall be of code gauge metal with continuously welded joints or of cast metal if called for on the Drawings. All junction boxes shall have gasketed screw covers. Boxes for use with aluminum conduits shall be of aluminum. Sheet steel boxes shall be galvanized after fabrications. Screws for galvanized steel box covers shall be made of brass. Screws for aluminum box cover shall be stainless steel.

B. Boxes Installed in Concrete

Boxes installed in concrete shall be cast iron alloy or copper free aluminum.

C. Rating of Boxes

Unless otherwise shown on drawings, all boxes installed indoors shall be rated NEMA 1 and all boxes installed outdoors shall be rated NEMA 3R. Boxes located in fire walls, exterior walls, and at the ceiling of the top floor shall be sealed with UL approved fire sealant material to maintain the rating of the separation as well as providing air sealing to maintain the buildings thermal envelope. Boxes located on opposing sides of rated walls i.e. unit separations, must be at least 24" apart or treated with putty pads per IBC.

2.4 OUTLET BOXES

A. Outlet Boxes for Concealed Work

Outlet boxes for concealed work shall be pressed steel boxes, galvanized and not less than #12 gauge. Each ceiling outlet designated for a lighting fixture shall have a fixture support secured in place with bolts and nuts. Ceiling boxes shall be octagonal with lugs and screws for back plates.

B. Outlet Boxes Installed Outdoors

Outlet boxes installed outdoors, in concrete or exposed, shall be cast iron alloy or copper free aluminum with gasketed covers.

C. Outlet Box Accessories

Provide outlet box accessories as required for each installation, including box supports, mounting ears and brackets, wallboard hangers, box extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used and to fulfill installation requirements for individual wiring situations.

2.5 WIREWAY

A. Wireway

Wireway shall be lay-in type, code gauge steel with dark gray epoxy paint finish inside and out.

B. Covers

Covers shall be hinged with captive screw fasteners for NEMA 1 & NEMA 3R wireway and gasketed quick release latch covers for NEMA 12 wireway.

2.6 SUPPORTS

A. Sizing

The Electrical Subcontractor shall size and provide all supports necessary for the installation of all raceway.

B. Channel Framing

Channel framing shall be manufactured by Unistrut, Kindert, B-Line or approved equal.

C. Indoor Locations

In dry, non-corrosive areas, channel framing and angle shall be galvanized steel or aluminum and all nuts, bolts and hardware shall be carbon steel, cadmium plated or hot dipped galvanized. Beam clamps shall be galvanized steel or malleable iron.

D. Outdoor, Wet or Damp Locations

In outdoor, wet or damp areas channel framing and angle shall be aluminum or 304 stainless steel and nuts, bolts and hardware shall be 304 stainless steel. Beam clamps shall be hot dipped galvanized steel or malleable iron.

E. Corrosive Locations

In corrosive areas, channel framing shall be 316 stainless steel, PVC coated steel or PVC coated aluminum. Nuts, bolts and hardware shall be 316 stainless steel. Beam clamps shall be PVC coated.

F. Supports

Supports shall be sized with a minimum safety factor of four or 200 lbs. whichever is greater.

PART THREE: EXECUTION

3.1 GENERAL

A. Requirements

See Specification Section 26.00.00 Subsection 3.1 for Wiring Methods.

3.2 INSTALLATION

A. Conduit, EMT, Boxes and Enclosures

Conduit, EMT, boxes & enclosures shall be installed so that they are mechanically secure, electrically continuous and neat in appearance.

B. Exposed Runs

Exposed runs shall be installed to conform to the shape of the surface over which they are run. Where they are run over a plane surface, they shall be straight and true. All exposed conduits shall be run parallel and perpendicular to building column lines and walls. Diagonal runs will not be permitted. Conduit runs in groups shall be supported by means of common members made of channel framing. Group mounting is not required where the group consists of only two conduits. Machine bolts with expansion shields shall be used when fastening to solid masonry or concrete. Toggle bolts shall be used to fasten to hollow masonry.

C. Spacing

Unless otherwise approved, spacing between conduit supports shall not exceed ten feet. Conduits shall not be supported from structural members marked "Removable" on the structural drawings. Conduit hangers and supports shall be fastened to buildings and structural members only and not to any equipment or piping. Separate conduits a minimum of 6" from flues, steam and hot water lines. Install conduit above mechanical piping wherever possible.

D. Conduit Supports

All conduit supports other than structural members shall be galvanized. The use of perforated strap or plumber straps will not be permitted.

Conduit up to 1-1/2 inches may be supported by one-hole malleable iron straps with clamp backs.

Conduit 2 inches and larger shall be supported by two-hole straps.

E. Conduit Run Lengths

Conduit runs shall not exceed 100 feet between boxes, fittings or devices.

PVC conduits run above grade shall be sufficiently supported to prevent sagging.

MC cables shall be neatly bundled and tie wrapped and sufficiently supported.

F. Use of Expansion Joints

All conduit crossing building or structure expansion joints shall be provided with approved expansion fittings.

3.3 BENDS

A. Field Bends

Field bends shall be made with approved bending tools. All field-formed bends shall be of maximum radius permitted by the design and construction conditions.

B. Exposed Conduit Changing Direction

Where a group of exposed conduits change direction, the bends shall have a common center in order to maintain the uniformity and neat appearance of the group, having regard for the minimum bending radius of the largest conduit in the group.

C. General

Bends shall be uniform radius and free from cracks, crimps or other damage to the conduit or its coating and shall not unduly flatten the conduit section.

3.4 JOINTS AND TERMINATIONS

A. Joints in Rigid Conduit

All joints in rigid conduit shall be threaded, using standard couplings. The use of running threads, threadless or split couplings is prohibited. When reaming out of conduit ends to remove burrs and rough edges, care shall be exercised to avoid excessive reaming which results in the weakening of the conduit wall at the end.

B. Tightening of Joints

All joints shall be made up wrench tight and with a minimum of wrench work in order to avoid wrench cuts.

C. Cut Threads

All cut threads shall be thoroughly painted with a coating of a rust inhibiting primer.

D. EMT Couplings and Fittings

EMT couplings and fittings shall be compression type on conduits up to 1-1/4 inch and double set screw type for conduits 1-1/2 inch and larger.

E. Conduit Terminations

All conduit terminations in panels, enclosures, outlet boxes and equipment shall be provided with bushings.

3.5 FLEXIBLE CONDUIT

A. Terminations

Flexible conduit shall be use to terminate all, lighting, motors, unit lanterns, transformers, pilot devices and vibrating equipment.

B. Liquitite Flexible Conduit

Liquitite flexible conduit and fitting shall be used outdoors and in all damp or wet areas, or where exposed to grease or oil.

C. Connections to Lighting Fixtures

Connections to lighting fixtures (lighting whips) shall be maximum length of 6 feet. All other flexible connections shall be maximum 24 inches.

3.6 PENETRATIONS

A. Penetrations through Slabs, Walls, Roofs

All penetrations through concrete slabs, masonry walls or roofs shall be provided with sleeves.

B. Sleeves

All sleeves shall be sealed to maintain the integrity of the structure. Fire resistant walls and floors shall be sealed with approved material, and shall maintain the original fire rating. All seals below grade shall be watertight, O.Z./Gedney type WSK or approved equal.

END OF SECTION 26 05 33

SECTION 26 24 16

PANELBOARDS

PART ONE: GENERAL

1.1 GENERAL REQUIREMENTS

A. Provisions

The provisions of Section 26 00 00, General Requirements for Electrical Work apply to the work of this section.

1.2 APPLICABLE CODES AND STANDARDS

A. Products

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

NEMA 250	Enclosures for Electrical Equipment
NEMA AB-1	Molded Case Circuit Breakers
NEMA KS-1	Enclosed Switches
NEMA PB-1	Panelboards
UL 50	Enclosures for Electrical Equipment
UL 67	Panelboards
UL 98	Enclosed and Deadfront Switches
UL 489	Molded Case Circuit Breakers and Circuit Breaker Enclosures
UL 943	Ground Fault Circuit Interrupters

1.3 SUBMITTALS REQUIRED

A. Manufacturer's product data sheets.

B. Circuit breaker schedules.

1.4 MANUFACTURERS

A. Subject to compliance with the specification requirements:

- Square D
- Cutler Hammer
- General Electric
- Siemens

PART TWO: PRODUCTS

2.1 GENERAL

A. Panelboards

Panelboards, including lighting and appliance panelboards and power distribution panelboards, shall be of the sizes, rating and arrangement shown on the drawings.

B. Overcurrent Devices

Panelboards shall be provided complete with all overcurrent devices, accessories and trim.

C. Safety Barriers

All panelboards shall be provided with safety barriers for dead front construction.

D. Short Circuit Ratings

The required short circuit ratings of assembled panelboards are shown on the Drawings. The short circuit rating of every overcurrent device in the panel shall meet or exceed the panel rating. Unless otherwise noted on the Drawings, series rated combinations will not be permitted.

2.2 CABINETS

A. Boxes

Boxes shall be code gauge galvanized sheet steel.

B. Trim

Trim shall be code gauge steel, ANSI-61 gray finish with stainless steel flush type lock/latch handle. All locks shall be keyed alike.

C. Surface Mounted Panels

Trim for surface mounted panels shall be door-in-door construction such that the gutter space may be exposed by a hinged door.

D. Frames

Directory frames shall be metal frame with plastic covers.

2.3 BUS

A. Bus Work

All bus work shall be 750 amp/sq.in. aluminum.

B. Neutral Buses

Unless otherwise noted on the drawings, neutral busses shall be 100% rated with adequate connections for all outgoing neutral conductors.

C. Panelboards

Panelboards shall be provided with aluminum ground busses.

D. Connection

Bus shall be designed for sequence phase connection to allow the installation of one, two or three pole branch circuit breakers in any position.

2.4 OVERCURRENT DEVICES

A. Device Type

Overcurrent devices shall be trip-free molded case, bolt-on, thermal magnetic circuit breakers.

B. Main Circuit Breakers

Main circuit breakers shall be individually mounted and bolted to bus assembly. Back-fed branch mounted circuit breakers are prohibited.

C. Circuit Breakers Frontfaces

Front faces of all circuit breakers shall be flush. Trip indication shall be clearly shown by the handle position between the ON and OFF positions.

D. Ground Fault Circuit Breakers

Ground fault circuit breakers shall be provided as required on the Contract Drawings and shall require no more panel space than standard breakers.

E. Connections

All connections shall be rated for 75°C copper conductors.

PART THREE: EXECUTION

3.1 GENERAL

A. Installation

Panelboards shall be installed in accordance with Manufacturer's Instructions. Panelboard mounting heights shall be mounted so the highest breaker switch device does not exceed 48" of the finished floor.

END OF SECTION 26 24 16

SECTION 26 28 16
SAFETY SWITCHES

PART ONE: GENERAL

1.1 GENERAL REQUIREMENTS

A. Provisions

The provisions of Section 26 00 00, General Requirements for Electrical Work apply to the work of this section.

1.2 APPLICABLE CODES AND STANDARDS

A. Products

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

NEMA KS-1	Enclosed Switches
UL 98	Enclosed and Deadfront Switches

1.3 SUBMITTALS REQUIRED

A. Manufacturer's product data sheets.

1.4 MANUFACTURERS

A. Subject to compliance with the specification requirements:

- General Electric
- Square D
- Siemens
- Cutler Hammer

PART TWO: PRODUCTS

2.1 GENERAL

A. Description

Safety switches shall be 240 VAC, NEMA heavy duty, horsepower rated visible blade type. Switches shall be non-fused or fused as indicated on the drawings. Lugs shall be front removable and UL listed for copper conductors. All current carrying parts shall be plated to resist corrosion.

B. Switch Operating Mechanism

The switch operating mechanism shall be spring activated quick make - quick break, such that during the normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening operation of the contacts has been started.

C. External Operating Handle

The external operating handle shall be an integral part of the box and not the cover. The operating handle shall also indicate the switch position, ON in the up position, OFF in the down position and be capable of being padlocked in the OFF position. An interlock shall be provided to prevent opening the cover when the switch is ON and prevent closing the switch contacts when the cover is opened. This interlock mechanism shall be provided with an externally operated override.

D. Arc Suppressors and Line Terminal Shields

Switches shall be provided with arc suppressors and line terminal shields. Arc suppressors shall be removable if necessary to facilitate access to line side lugs.

E. Number of Switched Poles

Single speed motors shall be provided with three pole switches. Two speed motors shall be provided with six pole switches.

F. Ground Kit

Switches shall be provided with a factory supplied ground kit.

G. Fused Switches

Fused switches shall be provided with class H or K fuses.

H. Short Circuit Rating

The UL Listed short circuit current rating of the switches shall be 10KAIC when used with Class H or K fuses.

I. Enclosures

Safety switches installed indoors shall be provided with NEMA 1 enclosures. Safety switches installed outdoors or in wet areas shall be provided with NEMA 3R enclosures.

PART THREE: EXECUTION

3.1 GENERAL

A. Installation

Safety Switches shall be installed in accordance with Manufacturer's Instructions.

END OF SECTION 26 28 16

SECTION 26 31 00

LIGHTING FIXTURES

PART ONE: GENERAL

1.1 GENERAL REQUIREMENTS

A. Provisions

The provisions of Section 26 00 00, General Requirements for Electrical Work, and section 26 05 33, Raceway and Fittings, apply to the work of this section.

1.2 APPLICABLE CODES AND STANDARDS

A. Products

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

CBM Labels	Certified Ballast Manufacturers Assoc.
NEC Art. 410	National Electrical Code
FCC, Part 18	RFI and EMI
ANSI C62.41	Line Transient Protection
UL 924	Emergency Lighting and Power Equipment
UL 1088	Temporary Lighting

1.3 SUBMITTALS REQUIRED

A. Data Sheets, Photometrics and Installation Instructions

Submit manufacturer's product data, photometrics, and installation instructions for each type of light fixture specified. Fixture submittals will be in booklet form with separate sheet for each fixture assembled in "luminaire type" alphabetical order, with proposed fixture and accessories clearly indicated on each sheet.

1.4 MANUFACTURERS

A. General

The fixture types, manufacturers and model number s are shown on the lighting schedule in the Contract Drawings. These fixtures and manufacturers are listed to establish a baseline type, style and quality of fixture to be provided. Although one manufacturer may be listed on this lighting schedule, other manufacturers' representatives may submit fixtures for consideration as "equal" fixtures to facilitate the "packaging" of the lighting fixtures within the representative's product lines. The architect and engineer however reserve the right to require certain individual fixtures be provided of the model and manufacturer specified in order to meet specific design intent by the architect or engineer.

PART TWO: PRODUCTS

2.1 GENERAL

A. Light Fixtures

Light fixtures shall be provided with housings, trims, drivers, lamp holders, sockets, reflectors, wiring and other components required, as a factory-assembled unit for a complete installation.

B. Electrical Wiring

Provide electrical wiring within light fixtures suitable for connecting to branch circuit wiring in accordance with N.E.C. Article 410, Paragraph 25.

C. Packaging

Deliver interior lighting fixtures shall be delivered in factory fabricated containers and wrapping, in order to properly protect fixtures from damage.

D. Storage

Interior lighting fixtures shall be stored in original packaging. Store inside well-ventilated area protected from weather, moisture, soiling, humidity, extreme temperatures, laid flat and on skids to keep off floors and ground.

E. Ceiling Fixtures

Fixtures installed in ceilings, suspended from ceilings or on walls shall be installed with a plastic film covering protecting the lens, louver and lamps from dust, dirt and debris during construction. Plastic film shall be removed upon the completion of construction.

2.2 LED FIXTURES

A. General

Provide LED fixtures of sizes, types and ratings indicated and specified in the Lighting Fixture Schedule on the Contract Drawings.

PART THREE: EXECUTION

3.1 GENERAL

A. Prior Examination

Examine all areas and conditions under which lighting fixtures are to be installed and structure which will support lighting fixtures. Notify the Contractor in writing of any conditions detrimental to proper installation and completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

B. Coordinate Installation

Coordinate light fixture installations with other trades. Coordinate all lighting fixtures with mechanical piping and ductwork to allow for proper clearance.

3.2 INSTALLATION

A. Locations and Heights

Install all lighting fixtures at locations and heights indicated, in accordance with the architectural reflected ceiling plans.

B. Fastening and Supporting Fixtures

Provide fixtures and/or fixture outlet boxes with hangers, channel or other method of fastening and supporting fixtures required for proper installation.

C. Pendant Mounted Fixtures

All pendant mounted fixtures shall be installed plumb and level or as detailed on the Contract Drawings. Pendant mounted fixtures longer than 18" shall have twin hangers of type specified.

D. Tightening Values

Tighten connectors and terminals, including screws and bolts in accordance with equipment manufacturer's published torque tightening values for equipment connectors. All screws and bolts shall have washers.

3.3 SPLICES AND TERMINATIONS

A. General

Twist on wire connectors shall be installed which utilize square-wire spring grips and thermo plastic shells. Install connectors to meet the manufacturer's torquing requirements. Install wire connectors of size required as not to exceed the manufacturers UL-listed CSA recognized wire combinations.

3.4 FIELD QUALITY CONTROL

A. Replacement of Lamps

At date of substantial completion, all lamps that are not functioning, have color deficiencies, or are noticeably dimmed shall be replaced with new lamps as determined by the Engineer.

B. Cleaning Light Fixtures

All light fixtures shall be cleaned of dirt and debris upon completion of construction. All finger prints and smudges shall be cleaned.

C. Protection During Construction

All installed fixtures during remainder of construction shall be protected in accordance with section 2.1.5 of this specification section.

D. Grounded

All light fixtures shall be grounded in accordance with article 250 and 410 of the NEC. Tighten connections to comply with tightening torques specified in UL 486A to assure permanent and effective grounds.

E. Damaged Light Fixtures

All light fixtures damaged in shipping or during installation shall be replaced with new fixtures at no cost to the owner.

END OF SECTION 26 31 00

STATE OF MAINE

**TELECOMMUNICATIONS
FACILITIES & WIRING
SPECIFICATIONS**



**OFFICE OF INFORMATION TECHNOLOGY
(OIT)
NETWORK SERVICES DIVISION**

REVISED NOVEMBER 2015

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SECTION A - TELECOMMUNICATIONS

A.1. **General**

Furnish and install all telecommunications jacks, outlets, conduits, raceways, ducts, cables, electrical wiring, electrical outlets, backboards, racks, air conditioning, flooring, sensors, alarms, and allied accessories, in accordance with any applicable specifications and drawings, and the specifications contained herein. Relocate or remove, as required, any existing jacks, outlets, conduits, raceways, ducts, cables, equipment, etc., due to architectural changes, or as shown on any applicable drawings, if such materials are not reused in the construction, or do not meet the specifications set forth herein.

A.2. **Included and Related Requirements**

Basic telecommunications requirements of this Division shall include, but shall not be limited to that which is described in the subsequent sections of this document as follows:

Included Work

Section B	Service Entrance
Section C	Switch Room
Section D	Wiring Closets
Section E	Basic Cable/Wiring Standards
Section F	Cable Television (CATV)
Section G	Paging Systems
Section H	Video Systems
Section I	Mechanical Equipment
Section J	Fiber Optic Cable Systems

Related Work

Section K	Removal of Old Cable and Facilities
Section L	Cutting and Patching
Section M	Temporary Utilities
Section N	Painting and Cleanup
Section O	Special Services and Facilities

A.3. **Definitions**

The following terms are defined as they are used and applied in the text of this document, and any accompanying or related text and/or drawings and sketches.

1. **Backboard**: A section or sections of wall-mounted plywood, ¾-inch thickness, on which telecommunications devices, fixtures and related equipment will be mounted.

SECTION A - TELECOMMUNICATIONS

2. Category 3 Cable: A 4-pair or other multiple twisted-pair telecommunications cable which has been designed, manufactured, and certified to meet all applicable EIA/TIA specifications for such cable. By current standards, Category 3 cable bears limited and specific usage.
3. Category 5 Cable: A 4-pair or other multiple twisted-pair telecommunications cable which has been designed, manufactured, and certified to meet all applicable EIA/TIA specifications for such cable. By current standards, Category 5 cable is obsolete and is no longer used.
4. Category 3 Hardware: Any telecommunications wiring/cabling hardware, such as telecommunications jacks or outlets, termination blocks, etc., which has been designed, manufactured, and certified to meet all applicable EIA/TIA specifications for such hardware. By current standards, Category 3 hardware bears limited and specific usage.
5. Category 5 Hardware: Any telecommunications wiring/cabling hardware, such as telecommunications jacks or outlets, termination blocks, etc., which has been designed, manufactured, and certified to meet all applicable EIA/TIA specifications for such hardware. By current standards, Category 5 hardware is obsolete and is no longer used.
6. Category 3 Installation: A telecommunications cable/facilities installation which meets all of the applicable EIA/TIA requirements and specifications for such installation, including cables, associated hardware, installation methods and practices. By current standards, Category 3 installations are limited and specific.
7. Category 5 Installation: A telecommunications cable/facilities installation which meets all of the applicable EIA/TIA requirements and specifications for such installation, including cables, associated hardware, installation methods and practices. By current standards, Category 5 installations are obsolete.
8. “Category 5e”; “Category 5 enhanced”: Terms that refer to telecommunications cable, terminating hardware and installation practices that exceed the specifications for “standard” Category 5 cable and terminating hardware, according to EIA/TIA requirements and specifications for such cable, terminating hardware and installation practices. This is the current general cabling standard for State owned or leased premises.
9. “Category 6”: Terms that refer to telecommunications cable, terminating hardware and installation practices that meet EIA/TIA requirements and specifications for such cable, terminating hardware and installation practices.

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The State employs Category 6 standards in very limited and specific installations, such as in data centers and testing laboratory environments.

10. CATV (Common Antenna Television): An acronym generally used in reference to “cable television” services and systems.
11. Certified: Equipment is “certified” if it has been tested, and found by a nationally recognized testing laboratory to meet recognized standards, or to be safe for use in a specified manner or application, and bears a label, tag, or other record of such certification.
12. CLEC (Competitive Local Exchange Carrier): See “LEC”.
13. Coax; Coaxial Cable: A special two-conductor cable in which there is a solid metallic “inner” or core conductor, covered by a flexible insulating dielectric material over which is placed a tubular solid or woven metallic “outer” conductor which shares a common radial axis with the inner conductor. The outer conductor of the coaxial cable is generally sheathed with a protective PVC, TFE, or polyethylene overall insulation. Associated with the cable is a specific ohmic impedance value, which is a function of the inner and outer conductor diameters and their radial separation through the dielectric. This cable has a relatively wide signal bandwidth.
14. CMP (Communications Plenum) Cable: An electrical, telecommunications, or any other type of cable bearing a special insulation and sheath which conforms to NEC and other related safety codes and standards for suppressing the release of noxious gas or toxic smoke when such cable is subjected to heat and flames. This cable is used in an unprotected environment (not in conduit), within any areas used for the ducting or transport of environmental air within or to any building or space designed for human occupation (Article 800, National Electrical Code).
15. Conduits: Piping or tubing used to encase telecommunications or other cables. There are four basic types of conduit, listed below, which are acceptable in specific instances:
 - a. S&D (Soil & Drain), PVC or HDPE (non-metallic);
 - b. Schedule 40 or 80 PVC (non-metallic);
 - c. EMT, a thin walled, steel electrical conduit;
 - d. Rigid, a heavy walled, solid, threaded, steel conduit.
16. Connecting Block: A telecommunications industry series of telecommunications cable termination/connection “blocks” used to organize,

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terminate and hold twisted pair wires and to provide a “cross-connect” point between such termination points of telecommunications cables.

17. Cover Plate: Also known as “face plate”. A special duplex electrical outlet box cover which mounts to the front of such a box, and which is designed to carry associated telecommunications outlet modules which ‘snap in” to such plate. These plates are typically designed to accommodate 2, 3, 4 or 6 telecommunications outlet modules.
18. Demarcation Point: The point at which the RBOC/CLEC/ILEC terminates its incoming service facilities within the premises. Also referred to as “handoff”.
19. Distribution/Cross Frame: A special frame or backboard which is used to receive telecommunications cables from a telecommunications switching system and/or incoming lines from the RBOC/CLEC/ILEC, and which facilitates the cut-down, termination and connection points of the telecommunications cables for distribution to terminal devices.
20. Duplex Electrical Box: A standard electrical outlet box which is typically fastened to a building wall stud for the flush placement of a duplex (2 outlet) electrical receptacle. It can also be used to flush mount telecommunications jacks and CATV outlets designed to fit into such a box.
21. EIA/TIA (Electronics Industry Association/Telecommunications Industry Association): A nationally recognized engineering standards body of electronics and telecommunications professionals, manufacturers, vendors and end-users, which sets various technical and manufacturing standards and specifications for electronic and telecommunications systems and equipment.
22. Face Plate: See “Cover Plate”.
23. Fiber Optics (Optical Fiber): In this context, either individual or multiple single-mode or multi-mode glass fiber cabling systems, which transport telecommunications signals in the form of high frequency light pulses.
24. Fiber Optic Cable: A special telecommunications cable which contains one or more optical glass fibers, each of which is covered with an identifying color-coded sheath, and all of which are covered with an overall sheath containing a structural strength member of Kevlar or similar material. It generally will contain no metallic structure or elements.
25. Fiber Optic Connector: A connector that is fastened to individual optical fibers through adhesive, heat or mechanical means. The connector provides a means to couple the optical fiber to termination panels and/or equipment using

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optical fiber interfaces. Fiber optic connectors are found in numerous coupling configuration designations such as LC, MTRJ, SC and ST, with LC and SC being the predominant couplings for optical fiber cable termination.

26. Fiber Optic Terminal: A wall or rack mounted enclosure designed for the termination of fiber optic cable, and which provides a connection point for cross-connecting fibers or for connecting electronic fiber optic transmitting/receiving equipment to the fiber optic cable.
27. Gas Tube Protection: A 3-element gas tube protection device, installed in series between the telecommunications cable and the equipment frame, jack or telecommunications outlet, and designed to protect the telecommunications equipment from electrical surges or spikes entering the telecommunications cable system, such as may be encountered during an electrical storm. This type of protection device is typically installed on a cable protection terminal in which the cable is terminated, on each pair of conductors within the cable that provide "POTS"-type service. Because of the higher voltage rating of these devices, they should not be used on cable pairs which service digital terminal or communications equipment.
28. Gauge: A term used to describe the physical diameter of a copper wire conductor, as defined by American Wire Gauge (AWG) standards.
29. Ground: (1) An electrical reference to earth potential; (2) Electrically connecting or bonding a conductor or conductive surface, such as electrical/electronic equipment frames, equipment racks/shelves, gas tube or solid-state protection frames, cable shields, etc. to an electrical ground.
30. ILEC (Incumbent Local Exchange Carrier): See "LEC".
31. Innerduct: A flexible, corrugated polymer tubing, usually orange in color, in which fiber optic cable is placed. It is used for the separation and protection of the fiber optic cable from other cables using the same conduit, raceway, riser shaft, etc.
32. Intermediate Distribution Frame (IDF): In a relatively large building, or a building with multiple floors, this is a space, closet, or room where station cables will be terminated for a given area within the building. It will also serve as a termination point for IDF-to-MDF "riser" cables, including copper, fiber optic, and CATV cables. This space, closet or room may will also house electronic switching, amplification and distribution systems for data LAN's, video and CATV systems. This may also be referred to as the "wiring closet".

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- 33. Key System (KSU): A relatively small electronic telephone switching system which is typically used in a small office environment, and usually accommodates 8 or less RBOC/CLEC/ILEC service lines and 24 or less telephone sets. By current standards, KSUs bear limited usage and are generally considered obsolete.
- 34. Labeled: Equipment is “labeled” if it bears a valid label, seal, or symbol of a nationally recognized testing laboratory, such as Underwriters Laboratory, Inc., recognizing its acceptability for the intended uses in these specifications.
- 35. LEC (Local Exchange Carrier): The local servicing public telephone or telecommunications service company or provider. May be CLEC (Competitive LEC) or ILEC (Incumbent LEC).
- 36. Listed: Equipment is “listed” if it is of a kind mentioned in any document, published by a nationally recognized laboratory which makes periodic inspections during production of such equipment, and states that such equipment meets nationally recognized standards, or has been tested and found safe for use in a specified manner.
- 37. Main Distribution Frame (MDF): A space, closet or room which serves as the central telecommunications cable and service distribution point for a premises. It will generally house the primary telecommunications voice, data, video, fiber optic, and CATV switching and distribution systems. It will serve as the connection point to RBOC/CLEC/ILEC services, the common termination point for IDF-to-MDF riser cables, including copper, fiber optic, and CATV cables, and will be the primary point for inter-building and intra-building cable cross-connections. This may also be referred to as the “switch room” or “main wiring closet”.
- 38. POTS: An acronym for “plain old telephone service”, that being the type of service typically offered to the general public and having the technical characteristics of such service. It may also be called an “analog line”.
- 39. Power Pole: Typically, a square or rectangular duct associated with modular furniture installations, which attaches to and extends vertically from such furniture through the ceiling, and affords a path for the extension of electrical and/or telecommunications cables into such furniture. May also be referred to as “tele-pole” or “com-pole”.
- 40. PBX (Private Branch Exchange): A generic term for an electronic telecommunications switching system.

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- 41. Quad Electrical Box: A standard electrical outlet box which is typically fastened to a building wall stud, and is designed for the flush placement of two duplex (2-outlet) electrical receptacles. It can be used to flush mount telecommunications jacks designed to fit into such a box.
- 42. RBOC (Regional Bell Operating Company): An essentially obsolete term used to designate the local ILEC, that typically being a descendant of the former Bell System, a provider of public telephone/telecommunications services.
- 43. Riser Cable: Generally, a telecommunications cable of 25 or more pairs which runs between and terminates in the IDF and MDF spaces of a premises, and affords telecommunications service transport between such spaces. It may also be called “vertical cable”.
- 44. Solid-State Protection: A semiconductor protection device, installed in series between the telecommunications cable and the equipment frame, jack or telecommunications outlet, and designed to protect the telecommunications equipment from electrical surges entering the telecommunications cable system, such as may be encountered during an electrical storm. This type of protection device is typically installed on a cable protection terminal in which the cable is terminated, on each pair of conductors within the cable. Solid-state protection devices are available in various voltage ranges, and should be selected and installed to meet the specific operational parameters of telecommunications equipment being attached to the cable, i.e., equipment with “POTS”-type (analog) line interfaces or digital line interfaces.
- 45. Station Equipment: See “Terminal Devices”.
- 46. Station Cable: Generally, a telecommunications cable of 4 pairs which runs between and terminates within the IDF/MDF space and the telecommunications jack. This may also be called “station wiring” or “horizontal cable”.
- 47. Switch Room: A generic term for a telecommunications switching equipment room or space, and is usually the room in which the MDF and telecommunications switching system and ancillary equipment are located.
- 48. Telecommunications Cable: A combination of two or more twisted-pair copper wire conductors, which are grouped or bundled in a protective overall jacket or sheath. Each conductor is insulated and color coded with a specific colored insulating material. Cables containing more than 25 pairs shall be fabricated such that specific groups of 25 pairs each, otherwise known as

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“binder groups” are formed and can be recognized as such through industry-standard color coding of the groups.

49. Telecommunications Jack: A fixture which generally combines 2, 3, 4 or 6 modular telecommunications outlets into a standard duplex electrical box, a quad electrical box, a self-contained surface mount fixture, or a portable furniture panel fixture. The voice and data outlets are physically similar (8-pin modular-style) and other outlets are specific to their function (coaxial, fiber optic).
50. Telecommunications Outlet: An 8-conductor modular-style device which terminates the telecommunications station cable at the station end, and allows for telecommunications equipment attachment to the station cable via an attachment cord. Unless otherwise noted, voice and data outlets shall conform to EIA/TIA 568B Category 5e specifications.
51. Terminal Device: A generic term for a telephone, facsimile, data device, printer, or other telecommunications equipment, connected by telecommunications cables or wiring.
52. Transient Voltage Protection: See “Gas Tube Protection”, “Solid-State Protection”.
53. Twisted-Pair: One pair of single-conductor copper wires, each wire encased in its own colored insulation, and twisted around one other in a spiraling fashion at no less than six revolutions or 360 degree “twists” per foot of length. Insulation material composition and exact twist geometry shall be dictated by the EIA/TIA Category certification requirements and cable manufacturing methods.
54. Uninterruptible Power System (UPS): A special power system installed between the commercial electrical source and telecommunications equipment which requires uninterrupted electrical power service. These systems are generally self-contained with an internal battery array. In normal operation, the UPS will condition and pass commercial power to the attached equipment, when such power is available and suitable for use. It will switch to internal battery power generation upon loss or degradation of the commercial power service, all without interruption of power service to the attached equipment.
55. Voice Over Internet Protocol (VoIP): A relatively new telephony service technology whereby telephones are connected to the data network rather than through use of legacy technologies such as POTS or ISDN. VoIP affords the use of the desktop/workstation data jack for connectivity of both a telephone and a computer workstation through a single data jack, thus, in many cases

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eliminating the requirement for individual voice and data jacks at the desktop/workstation.

- 56. Whip: Typically, a section of flexible PVC electrical conduit with connector fittings, associated with modular furniture installations, which attaches between such furniture and a “hard” wall, and affords a path for the extension of electrical and telecommunications cables into such furniture.
- 57. Wiring Closet: A space, closet, or room where station cabling will be terminated for a given area within the building. It will also serve as a termination point for IDF-to-MDF “riser” cabling, including copper, fiber optic, and CATV cables. This space, closet or room may also house electronic switching, amplification and distribution systems for data LAN’s, video and CATV systems. This may also be referred to as the “IDF”.
- 58. 66 Block: An older style twisted-pair cable termination/cross-connect block which uses exposed split metal posts or tabs to capture the wire conductor end and provide an electrical path to another similar wire conductor, thereby facilitating a “cross-connect”. By current standards, 66 blocks bear limited usage and are generally considered obsolete.
- 59. 110 Block: A newer style twisted pair cable termination/cross connect block which uses a series of “captive caps” with integrated recessed conductor tabs. The “bottom” of the captive cap terminates the pairs of a given cable into the bottom of its conductor tabs. The “top” of the cap provides captive “grooves” for the termination or “punch-down” of another cable into the top of its conductor tabs, thereby facilitating a “cross-connect”.
- 60. 110-JP Block: A specially designed 110-style termination or “punch-down” block which has integral 8-conductor modular (RJ-45 style) receptacles to facilitate direct connection of data equipment to the block via a “patch cord”. These blocks are generally used in an IDF, MDF, or a computer/data equipment room where multiple connections are concentrated. Single blocks are typically available with modular receptacle counts of 12 or 36. By current standards, 110-JP blocks are considered obsolete.

A.4. Product Criteria

- 1. Products used in construction projects shall be the standard products of a manufacturer regularly engaged in the manufacture of those products.
- 2. Unless approved by the Network Services Division, items of equipment shall essentially duplicate equipment that has been in satisfactory use in the industry for at least five years.

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3. Products shall be supported by a service organization which maintains an adequate inventory of repair parts and is located reasonably close to the site.
4. When two or more units of materials or equipment of the same type or class are required, they shall be products of the same manufacturer.
5. All factory wiring of pre-assembled components shall be accompanied by wiring diagrams.

A.5. Miscellaneous

1. Safeguarding Materials/Work Areas: Responsibility for the safeguarding, care, and protection of all materials and work rests with the contractor until the entire project has been completed, tested, and accepted.
2. Regulatory Requirements: All work shall conform to the requirements of all applicable codes, laws, regulations, local ordinances, and contractors shall cooperate with all authorities having jurisdiction. Compliance with laws and regulations on this project does not relieve the contractor from compliance with more restrictive requirements contained in these specifications.
3. Permits, Fees, Inspections: The contractor shall secure and pay for all permits, fees, inspections, street opening charges, "DigSafe" and any fines assessed in connection with this project.
4. Warranties: Any manufacturers' warranties shall be passed on to the owner at the completion and acceptance of the project. The Contractor shall warrant all material and workmanship to be in compliance with these specifications, according to standards acceptable to the Architect/Engineer and/or the industry. The Contractor shall also warrant their installations to be free of defects in both materials and workmanship for a period of one year, or longer if specifically called for in the general policies section of the specifications dealing with the entire project.

SECTION B - SERVICE ENTRANCE

B.1. General

Furnish all labor, materials, equipment, supplies and perform all operations necessary to complete the service entrance work, in accordance with the applicable project drawings and these specifications. Furnish “as built” telecommunications drawings at the completion of the project.

B.2. Point of Entry

The entrance to the premises shall be at a point mutually acceptable to the owner and the RBOC/CLEC/ILEC, which usually is a point closest to the current facilities of the RBOC/CLEC/ILEC.

B.3. Entrance Methods

1. Buried: From the designated entrance point of the RBOC/CLEC/ILEC facilities, there shall be conduit(s) buried at a minimum depth of 24 inches, using Schedule 40 or 80 PVC pipe. In areas subject to vehicular traffic, the conduit(s) shall be encapsulated in concrete to a minimum thickness of 3 inches, running the full length of the traffic area. In all areas where public streets are crossed, rigid steel conduit shall be used. All conduits shall be capped after installation to protect them from weather elements and debris. Unless otherwise specified, the minimum size and count for building service entrance conduits shall be as follows:
 - a. Up to 25,000 sq. ft. floor space, one 4-inch diameter;
 - b. For 25,000 to 100,000 sq. ft. floor space, two 4-inch diameter;
 - c. Over 100,000 sq. ft. floor space, three 4-inch diameter.
2. Aerial: If the electrical power service entrance to the premises is aerial, the Architect/Engineer may specify that the telecommunications entrance be aerial as well, up to a maximum entrance cable size of two-hundred (200) pairs (anything larger shall be brought in underground). Any aerial entrance shall be in compliance with RBOC/CLEC/ILEC requirements. All aerial telecommunications cable must be at least two (2) feet lower than any electrical entrance, and shall carry to a standard weather head allowing eighteen (18) feet clearance for any vehicular traffic. A minimum 2-inch diameter weather head and conduit shall be installed to carry aerial cables into the premises.

In either case, any conduits shall be permitted to have only “long sweep” elbows, with not more than 270 degrees of cumulative direction change between any two pulling points (conduit ends or pull boxes). Generally, the conduits shall be continuous from the point of entry into the telecommunications switch room or other designated demarcation point. If the cable run, from the point of building entry into the premises demarcation point, is greater than 50 feet, the entrance cable shall be terminated in a suitable location within 50 feet of the entrance point and a suitable interior cable shall be spliced to it to continue to

SECTION B - SERVICE ENTRANCE

the demarcation point, unless installed in a suitable conduit which is continuous from the building penetration point to the telecommunications room, or unless the cable material meets applicable codes and standards for open installation within the premises. If the total run of the entrance cable exceeds 150 feet, a suitable pull box may be required, and shall be mounted at the nearest point of entry, inside the building.

B.4. Entrance Cable

The telecommunications entrance cable shall be appropriately sized, twisted pair, gel-filled, and specifically designed for underground or exterior usage (REA PE-89 type cable). The cable and labor to install it will generally be provided by the RBOC/CLEC/ILEC. It is up to the Contractor to make this determination and to provide such cable and installation if the RBOC/CLEC/ILEC does not. If the Contractor supplies the entrance cable, it shall be 24 gauge (minimum) telecommunications cable.

In certain instances, fiber optic and CATV entrance cables may be required. Please refer to the appropriate sections in this document and any included special attachments for details on such requirements.

B.5. Switch Room Cable Entrance

The entrance conduit may enter the switch room from either below the floor or through the ceiling, or through an exterior wall at an appropriate height. In either case, appropriate bushings shall be used in the open ends of the conduit to ensure a smooth edge against the cable, and shall be properly sealed on both ends to ensure no leakage or penetration of water into the switch room. All metallic telecommunications entry conduits shall be bonded to the building's grounding system, in accordance with NEC and/or EIA/TIA specifications. Since the RBOC/CLEC/ILEC may furnish and install the cable, the contractor shall leave a pull rope in the conduit to assist the RBOC/CLEC/ILEC. Entrance of the conduit into the switch room should be in a corner location allowing a left to right breakdown of the cable onto the backboard(s) provided.

SECTION C - SWITCH ROOM

C.1. General

Furnish all labor, materials, equipment, supplies, and perform all operations necessary to complete the switch room work, in accordance with the applicable drawings and these specifications.

C.2. Size

The switch room shall be a secure room, accessible by service technicians from a common area (hallway, lobby, etc.), air conditioned, and with a two hour fire rating. Unless otherwise specified and approved, the overall size of the switch room shall generally be as follows:

1. Buildings less than 5,000 sq. ft., switch room of 6 x 6 ft.;
2. From 5,000 to 10,000 sq. ft., switch room of 8 x 10 ft.;
3. From 10,000 to 25,000 sq. ft., switch room of 10 x 12 ft.;
4. Greater than 25,000 sq. ft., switch room of 10 x 16 ft.

All shall have a minimum floor-to-ceiling height of 8 ft.

C.3. Lighting

The switch room shall be fitted with flush or surface-mounted, switched ceiling lights that will provide fifty (50) foot-candles at desktop levels in any area of the room. LED lighting is now the preferred method.

C.4. Air Conditioning

Switch room shall be air-conditioned with a positive pressure and fresh air make-up, with either its own unit or a dedicated air supply and a return air duct from the room, or exhaust louvers with automatic fire dampers which will close in case of fire. Air conditioning must be continuous, 24 hours per day, every day. See Section I for size estimates. Dedicated split-ductless air conditioning units are now the preferred method of cooling telecommunications MDF/IDF spaces. If the switch room is cooled by common building HVAC system, the air supply to the room shall be controlled by thermostatic control dedicated to the room.

C.5. Environmental Requirements

The air supplied to the equipment room must be clean and dry. Temperature must be held between 45 degrees and 85 degrees F., with a designed continuous operating temperature of 72 degrees F. Relative humidity must be maintained between 20% and 80% (non-condensing) with a designed continuous operating level of 45%.

SECTION C - SWITCH ROOM

C.6. Sprinklers/Fire Rating

If any building specifications and/or safety and fire laws, codes, ordinances or other regulations require a fire sprinkler system to be installed in the switch room, then such system shall be a dry-charged (pre-action) water system. The floor, ceiling, and walls will be constructed to meet the two (2) hour fire rating requirements, including a 36-inch wide, solid metal door and frame.

C.7. Location of Entrance Cable

Entrance cable conduit shall be brought into one corner of the room that will afford a left to right breakdown of cables onto backboards mounted on two adjacent walls. In a case where there are multiple buildings within the project, two 4-in. diameter conduits shall be run from the switch room to either another switch room or wiring closet in the other buildings. All telecommunications cable between buildings shall be gel-filled PE-89 type twisted-pair, 24 gauge (minimum) cable for analog telephone service and Category 5e/6 or fiber optic of the suitable type for data network service. A pull rope must be installed with each cable. Gas tube and/or solid-state protection is required at each end of copper cables for all inter-building cables. Cables must be installed without back taps (dedicated point-to-point).

C.8. Cable Sizes

All twisted-pair telecommunications cables between buildings, and from the RBOC/CLEC/ILEC into the switch room (if contractor supplied), shall contain, as a minimum size, 24-gauge conductors. In multiple story buildings (three or more floors), riser cables from the main switch room (MDF) to remote wiring closets (IDF) shall be 24-gauge (minimum) interior cable, ARMM type. Generally, the pair count in any riser cable shall be equal to the telecommunications jack count within any area(s) being served by such cable, times 4. For example, if there are going to be 20 telecommunications jacks installed in an area, a minimum 80-pair count cable is required ($20 \times 4 = 80$). In this case, since there is no manufactured 80-pair cable, the next highest standard count cable (100-pair) would be installed. Project specifics may relax this requirement if a VoIP telephone installation is employed.

C.9. Backboards

Backboards shall generally be 4-ft. x 8-ft. x $\frac{3}{4}$ -in. plywood sheets of good quality, painted two coats with a black or medium-gray semi-gloss or satin finish latex paint which maintains the aesthetic quality of the room, mounted thirty-six (36) inches above the floor, as measured from the lowermost edge of the backboard. The horizontal span of

SECTION C - SWITCH ROOM

single backboards (1 wall installation) shall be 1 ft. less than the length of the wall on which they are mounted, and such backboard shall be horizontally centered on the wall, leaving a 6-in. space on either end between the adjacent wall and the end of the backboard. In multiple backboard installations that meet in room corners, the backboards shall form a continuous corner surface with no gaps. These backboards will, in part, facilitate the construction of the Main Distribution Frame (MDF), and may be referred to as such. All backboards shall be securely fastened directly to the finished wall structure, using appropriate fasteners for the surface to which such backboards are being fastened. Wall surfaces must be finished and painted prior to backboard installation. Generally, backboards shall be mounted with the 4-ft. dimension in the vertical, 36-in. above the finished floor (AFF).

C.10. **Electrical**

Overhead lighting operation shall be controlled by a flush-mounted switch(s) adjacent to the strike side of the entrance door to the switch room. Duplex electrical outlets shall be provided (flush mounted) below the bottom edge of the backboards, and on all other walls, at approximately 72-in. centers (i.e., 2 duplex outlets in an 8-ft. backboard), with a minimum of 1 outlet per wall. If more than 2 outlets will be placed in the room, then there shall be a maximum of two outlets per 20-amp circuit, and adjacent outlets shall be on alternating circuits.

A minimum 100-ampere service/breaker panel with an isolated ground bus shall be located within and dedicated to the telecommunications switch room, and shall be connected directly to the main electrical service entrance of the premises. The panel shall be one from a common and widely recognized manufacturer.

The service panel ground bus shall be properly grounded, by an appropriately sized copper conductor, to a dedicated ground rod, bus or other ground point, according to National Electrical Code requirements for isolated grounds for service panels that provide electrical power to computer and/or electronic equipment.

A ground rod, bus or ground cable of minimum size 6 AWG, which is not associated with the isolated ground of the electrical service panel, shall be made available near the entrance conduit and backboard, to enable the direct grounding of gas tube and solid-state protection devices, switching equipment and any ancillary equipment requiring such a ground.

If the switch room contains its own air conditioner or other equipment, which uses electric motors or otherwise presents a relatively heavy load to the electrical service, then such equipment shall be powered from electrical service which is independent of the switch room service panel.

Local fire code may require the installation of an emergency electrical switch, in close proximity to the entrance door, which can disable all power in the room.

SECTION C - SWITCH ROOM

NOTE: THE ABOVE REQUIREMENTS ARE GENERAL IN NATURE. THERE MAY BE SPECIFIC REQUIREMENTS DUE TO EQUIPMENT CONFIGURATION. CONTACT THE STATE OF MAINE, OFFICE OF INFORMATION TECHNOLOGY / NETWORK SERVICES DIVISION (207-624-8800) BEFORE SPECIFICATIONS ARE WRITTEN.

C.11. **Finish**

The switch room floor finish shall be sealed (painted) concrete, vinyl floor covering (VCT), or non-static carpet. Walls and ceiling (except “suspended” ceiling) shall be painted two coats of satin or semi-gloss paint, in either off-white or light beige color. Steel doors and louvers (if any) shall be painted in accordance with the general painting section, or as the Architect/Engineer shall direct. Backboards shall be covered with two coats of black or medium-gray satin or semi-gloss latex paint.

C.12. **Distribution**

There shall be conduits exiting the switch room from a point diagonally across from the entrance cable, either through the ceiling or into the floor. The size and number of conduits shall be dependent on the total size of the building and the number of associated wiring closets (next section). After all cabling is in place, all conduit openings shall be sealed with a fire barrier sealant which conforms to electrical codes (such as 3M Fire Barrier Sealer), to ensure a positive seal against rodents, moisture, smoke or gas ingress/egress.

C.13. **Telecommunications Jacks**

There shall be a minimum of two telecommunications jacks at the standard electrical outlet height, in the approximate location of any work desk that may be placed in the room. The jacks shall be wired using the same specifications as for the balance of the premises. The employment of VoIP telephony may relax jack quantity in any given area.

C.14. **Keying/Securing**

The switch room entrance door shall be lockable. The locks for the switch room (MDF) and all other telecommunications-related rooms, closets, or cabinets within the premises shall be keyed identically, and such keys shall be unique from any other lock and key combinations present within the premises.

C.15. **Fire Extinguisher**

There shall be a U.S. DOT (Department of Transportation) approved carbon dioxide (CO2) type fire extinguisher bearing a minimum UL (Underwriters Laboratories) rating

SECTION C - SWITCH ROOM

of 10B:C, mounted on the wall or in a recessed cabinet, on the outside of the switch room, immediately adjacent to the handle side of the entrance door.

C.16. Shelves & Electronic Racks

Two shelves, one 12-in. depth x 4-ft. length and one 18-in. depth x 4 ft. length, may be required, adjacent to the PBX on the MDF. The 18-in. x 4-ft. shelf should be fitted with a 1-in. slot or gap at the back edge to allow for cable feeds. There may also be requirements for electronic equipment racks (relay racks). Specific requirements shall be determined and approved by Network Services Division personnel prior to any construction.

C.17. Locations

If the switch room (MDF) is to be used to terminate station (horizontal) cables, it must be located so that any telecommunications outlets, whose station cables will terminate directly in that room, will be within 295 cable-feet (90 meters) of that room, per EIA/TIA specifications for maximum horizontal cable distances.

Placement of switch rooms, closets, and jacks must be approved by the Office Of Information Technology, Network Services Division.

C.18. Other Uses

The switch room and wiring closets shall be solely for the use of telecommunications equipment and personnel. They should be considered remote locations owned by the Network Services Division. No storage of any type or any other use of the room shall be permitted.

SECTION D - WIRING CLOSETS

D.1. General

Furnish all labor, materials, equipment, supplies, and perform all operations necessary to complete the wiring closets, in accordance with the applicable drawings and these specifications.

D.2. Size

A wiring closet(s) shall be a secure room(s), accessible by service technicians from a common area (hallway, lobby, etc.) and shall be constructed to meet a one (1) hour fire rating. Sizes will vary, depending upon telecommunications requirements, but will roughly fall into three categories as follows:

1. Dedicated room, of dimensions approximately 6 ft. (D) X 6 ft. (W) x 8 ft. (H);
2. Recessed closet, adjacent to a hallway, fitted with a double access door, with dimensions of approximately 4 ft. (D) X 6 ft. (W) X 8 ft. (H);
3. Wall access panel, recessed into a hallway or corridor wall, and of dimensions approximately 2 ft. (D) X 4 ft. (W) X 4 ft. (H).

D.3. Lighting and Environmental Requirements

Wiring closets shall be provided with continuous positive ventilation with exhaust through door/wall louver(s). Normal building environmental air is sufficient provided it shall be clean, dry and free of corrosive fumes or other airborne contaminants, be maintained at a temperature between 45 degrees F, and 85 degrees F, and have a humidity content between 20% and 80% (non-condensing). Equipment in wiring closets may generate approximately 500 - 1000 BTU/hr or more (contact State Network Services Division for actual BTU ratings). Lighting which provides 50 foot-candles throughout is also required. Positive cooling methods (air conditioning) may be required in larger wiring closet applications.

D.4. Sprinklers

If any building specifications and/or safety and fire laws, codes, ordinances or other regulations require a fire sprinkler system to be installed in the wiring closet(s), then such system shall be a dry-charged (pre-action) water system with pre-action control (smoke + heat rate-of rise sensing).

D.5. General Layout and Location

All wiring closets shall contain plywood backboards of 3/4-in. thickness, covered with two coats of black or medium-gray semi-gloss or satin latex paint, and shall be constructed in a manner similar to that detailed in Section C.

SECTION D - WIRING CLOSETS

The incoming conduit from the switch room shall terminate at the left end of the backboard in the wiring closet to allow a left to right breakdown of riser cable(s). On the right end of the backboard, there shall be conduit exit points for horizontal cable distribution throughout the premises. These exit points shall either be full conduits or sleeves through the ceiling, floor, or shall otherwise employ an exit method which can be made tight (foam-filled in the ends of conduits, sleeves, etc.).

In any multiple story building, there shall be a minimum of one wiring closet per floor. On any floor of any relatively large building, there shall be a sufficient number of wiring closets strategically placed throughout the floor, which will ensure current and future adherence to the 295 (maximum) cable-feet (90 meters) EIA/TIA specification for station-to-IDF (jack to wiring closet) horizontal cable runs. Wiring closets shall be serviced by dedicated copper (ARMM type) and optical fiber riser cables from the MDF. Riser cables shall be sized (pair count) according to specifications in Section C.

Location of closets and jacks must be approved by the Office Of Information Technology, Network Services Division.

D.6. Electrical

Each wiring closet shall have a minimum of two duplex electrical outlets, on a 20-amp circuit that is dedicated to that closet. The circuit breaker for this circuit must be proprietary to telecommunications usage, and shall be explicitly marked "VITAL TELECOMMUNICATIONS POWER CIRCUIT - TRIP IN EMERGENCY ONLY". Each closet shall be provided with a switched light source sufficient to support easy visual identification of telecommunications wiring and to support any telecommunications maintenance activity in the closet.

D.7. Finish

Finish of closets shall be aesthetically acceptable and comparable to surrounding areas in both quality and color.

D.8. Keying/Security

All wiring closet entrance doors shall be lockable. The locks for all wiring closets (IDF) and all other telecommunications-related rooms, closets, or cabinets within the premises shall be keyed identically, and such keys shall be unique from any other lock and key combinations present within the premises. In instances where the premises employs electronic card reader access systems, such entrance control to telecommunications spaces is the preferred method.

D.9. Fire Extinguishers

SECTION D - WIRING CLOSETS

Location of fire extinguishers in or near wiring closets shall generally follow the fire and safety codes which apply to the general physical area(s) adjacent to the wiring closet.

D.10. Other Uses

All wiring closets shall be solely for the use of telecommunications equipment and personnel. They should be considered remote locations owned by the Network Services Division. No storage of any type or any other use of the closets shall be permitted.

SECTION E - BASIC WIRING STANDARDS

E.1. General

Furnish all labor, materials, equipment, supplies and perform all operations necessary to complete the telecommunications cable wiring, in accordance with the applicable drawings and these specifications. All wiring must also be performed in accordance with the National Electric Code and any State or Local Building Codes.

E.2. Scope; Services

The total number of cable runs and the sizes of the cables shall be dependent upon the size, occupancy, and use of the premises.

1. All interior cables to the telecommunications jacks ("horizontal cables"), whether intended for immediate or future use, shall be a minimum of two four-pair, non-shielded, PVC (non-plenum rated) jacketed or TFE/FEP (plenum rated) jacketed, 24 gauge twisted pair cable, with a minimum EIA/TIA certification of Category 5e, one to the "voice" outlet and one to each of the "data" outlets of each telecommunications jack. The voice cables shall have an outer jacket that is gray in color. The data cables shall have an outer jacket that is blue in color. There shall be no exceptions to cable color code. Note: THIS IS MINIMUM TWO SEPARATELY SHEATHED, 4-PAIR EIA/TIA CATEGORY 5e CABLES TO EACH JACK LOCATION. ANY DEVIATION FROM THIS REQUIREMENT MUST BE APPROVED BY THE NETWORK SERVICES DIVISION OF THE OFFICE OF INFORMATION TECHNOLOGY. A typical deviation from this requirement would be considered by the employment of VoIP telephony within the premises.
2. All such cables shall be connected to or "cut down" on the appropriate outlets and terminal blocks, as required herein. The following manufacturer-specific jack hardware shall be used, as required by project specifics, for wall-flush, wall-surface or portable furniture mount (Lucent/Avaya/Commscope part #s, "equivalent" in subsequent language means current Commscope/SYSTIMAX part #). Face plate color exceptions for portable furniture applications (color match) may be specified in project-specific requirements:
 - a. Ivory-colored wall flush-mount face plate, 2-position, M12A-246, or equivalent;
 - b. Ivory-colored wall flush-mount face plate, 3-position, M13A-246, or equivalent;
 - c. Ivory-colored wall flush-mount face plate, 4-position, M14A-246, or equivalent;
 - d. Ivory-colored wall surface-mount box, 2-position, M102SMB-B-246, or equivalent;
 - e. Ivory-colored wall surface-mount box, 4-position, M104SMB-A-246, or equivalent;

SECTION E - BASIC WIRING STANDARDS

- f. Ivory-colored modular furniture-mount face plate, 3-position, M13C-246, or equivalent.

Each face plate or box shall carry, at a minimum, one ivory-colored “snap-in” Category 5e modular outlet (voice) MPS100E-246 or equivalent, and one orange-colored “snap-in” Category 5e modular outlets (data), MPS100E-112 or equivalent, as required, unless project specifics dictate otherwise (VoIP installations).

- 3. All 4-pair cables shall be run from the telecommunications jack to the MDF or to the designated IDF for any given area within the premises, and each such run shall be no longer than 295 cable-feet (90 meters), per EIA/TIA specifications for such cables. The cables shall be identified by a jack number and by function (voice or data). The “voice” cables shall be terminated at the IDF or MDF on “110” termination blocks. The “data” cables shall be terminated on Category 5e “110-JP” termination blocks or rack-mounted patch panels. Where IDF spaces are employed, there shall be multi-pair riser cable(s) run from each IDF to the MDF of sufficient total pair count to accommodate the total pair count for both voice and data jack terminations in each IDF space. Sufficient cable length must be left at all cable ends to allow for the proper dressing and cut-down of the cable. Riser cables shall be terminated on “110” termination blocks. All cables shall be run in one continuous length from the jack to the designated termination point (IDF/MDF), with no splices or intermediate terminations in such cables.
- 4. All riser cables shall be of 24-gauge, sheathed, twisted-pair, color coded and appropriately sized (pair count) for the installation. Fiber optics riser cables may also be required when data design specifications are exceeded on twisted pair cable (see Section J for fiber optics specifications).
- 5. In all instances where telecommunications cable is run, either between the switch room and wiring closets, and/or from wiring closets or the switch room to the jacks, and where such cable is not in conduit, the cable must be fire rated. In those instances where cables are run in or through any spaces which are used in any way for environmental air, such cable shall be CMP (National Electric Code Article 800, Plenum Cable) rated, and shall be labeled as such.
- 6. For cable runs between switch room and wiring closets, there should be adequate backboard space provided for the cables and associated termination hardware (see Section C). Both cable ends shall be cut down on termination blocks as specified. All cables and pairs must be appropriately labeled.
- 7. Placement of telecommunications jacks in any building(s) should be determined by the following general rule; “Wherever an electrical outlet is located, there shall also be located a telecommunications jack, spaced 16 to 24 inches in the horizontal from, and at the same vertical height as such electrical outlet. Exceptions are generally as follows:

SECTION E - BASIC WIRING STANDARDS

- a. closets;
- b. restrooms;
- c. mechanical rooms (boiler, pump, generator, etc.);
- d. stairwells and hallways;
- e. any large open interior spaces designed specifically for modular furniture installations.

In cases where modular (portable) furniture is to be installed, there shall be, at a minimum, one telecommunications jack located within the furniture baseboard, as close as possible to each desktop work area or workstation location. Each jack shall carry, at a minimum, one Category 5e (voice) and one Category 5e (data) telecommunications outlet, unless project specifics dictate otherwise (VoIP installations). Ingress/egress of the associated telecommunications cables within modular furniture shall be facilitated using a whip or a power pole/"tele-pole", depending upon the specific architectural plan. In the case of whip installation from "hard" walls to the modular furniture, there shall be whips dedicated to telecommunications cables, and, under no circumstances, shall any telecommunications cables share a whip with any electrical or other non-telecommunications cables. There shall be duplex or quad electrical boxes installed in the hard walls, at the standard electrical outlet height, and at strategic points along such walls for connection of the whips to the walls. Such boxes will provide an egress point for telecommunications cables which are routed within the wall void from the overhead spaces. In-wall conduit from such boxes to the overhead spaces will typically be required to afford secure and unobstructed passage of the telecommunications cables through the wall void. All in-wall conduits and furniture whips shall be sized appropriately to afford a maximum 40% cross-sectional cable loading for the number of telecommunications cables required in each such conduit and/or whip. In the case of power pole installation from the overhead, it is possible that electrical and telecommunications cables might share a common power pole. In these instances, electrical and telecommunications cabling within any power pole must be separated by a sheath, conduit, compartment or other method which meets all applicable National Electrical Code (NEC) requirements for such installation. The telecommunications cable compartment in any such pole shall be sized appropriately to afford a maximum 40% cross-sectional cable loading for the number of telecommunications cables required in each such pole, and such compartment shall not be shared with any non-telecommunications cables. In all cases, final count and placement of modular furniture telecommunications jacks, power poles and whips shall be determined by the floor plan, and with the approval of the owner/tenant and the Office of Information Technology, Network Services Division.

This rule should be scrutinized carefully between architect/owner/tenant, in order to understand the designed use, and possible future use of specialized areas, such as classrooms, conference areas, hearing rooms, libraries, etc., and to plan for telecommunications jack placement accordingly.

SECTION E - BASIC WIRING STANDARDS

Any areas such as conference rooms, gymnasiums, armories or other spaces that might be used in an emergency or special situation to support a phone bank, call distribution center, or emergency support group should be configured with additional telecommunications facilities. The Network Services Division can provide cost effective suggestions.

8. All vertical and horizontal cable runs must be independently suspended by approved hangers, trays, ducts or raceways. All telecommunications cables must be placed to avoid electromagnetic interference caused by electrical/electronic devices, such as florescent light ballasts, electric motors, generators, power supplies, radio transmitters, etc.
9. All jacks must be placed within 295 cable-feet (90 meters) of the switch room or IDF in which such wiring terminates, per EIA/TIA specifications for such cables. The Network Services Division must review and approve placement of jacks.
10. All cable installations shall be tested and verified for proper conductor pair polarity, sequence and continuity. All Category 5e installations will be performed in accordance with all installation practices and guidelines that are recommended for such installation. All Category 5e installations shall be tested and verified for compliance with all applicable standards for such installation, and a complete certification report shall be compiled and submitted to the Network Services Division upon the completion of installation and certification testing.

E.3. Labeling

1. General: Identification labeling of all installed telecommunications facilities and systems shall be specified by the Network Services Division.
2. Trunk/Riser Cables: All telecommunications trunk and riser cables (copper twisted pair, optical fiber, coaxial, etc.) shall carry a unique identification label at both ends of each such cable, and related termination hardware shall be labeled likewise. Specific labeling requirements shall be developed for each installation.
3. Voice/Data Station Jacks, Termination Blocks and Patch Panels: All telecommunications jacks, outlets, termination blocks, patch panels or other terminating hardware shall carry a unique, sequential identification label for each "circuit" formed by a given cable and its associated outlet, termination block position or patch panel port. Telecommunications jack, outlet, termination block and patch panel labeling schemes within any building subject to this Specification shall be in keeping with a logical, orderly, and sequential layout, based on the architectural floor plans for the building, and all such labeling schemes shall be determined and approved by the Network Services Division.

SECTION F - CABLE TELEVISION (CATV)

F.1. General

Furnish all labor, materials, equipment, supplies and perform all operations necessary to complete the cable television work, in accordance with the applicable drawings and these specifications. All work must be performed in accordance with the National Electric Code and any State and Local Building Codes.

F.2. Point of Entry

The CATV service entrance to the premises shall be at a point mutually acceptable to the owner and the local CATV service provider. If the signal is to be provided by antenna arrangements, then it shall be in accordance with the general architectural plans showing that point closest to the area within the premises that is intended to house the receiving or “head-end” equipment.

F.3. Entrance Methods

1. Buried: From the property line closest to the CATV service provider facilities “drop”, there shall be a conduit(s) buried at a minimum depth of 24 inches, using minimum 2-inch diameter schedule 40 or 80 PVC pipe. In areas subject to vehicular traffic, the conduit(s) shall be encapsulated in concrete to a minimum thickness of 3 inches, and running the full length of the traffic area. In all areas where public streets are crossed, rigid steel conduit shall be used. All conduits shall be capped after installation to protect them from weather elements and debris.
2. Aerial: If the electrical power service entrance and other telecommunications service entrances to the premises are aerial, the Architect/Engineer may specify that the CATV entrance be aerial as well. Any aerial entrance shall be in compliance with the CATV service provider requirements. All aerial CATV cables must be at least three (3) feet lower than any electrical entrance, and shall carry to a standard weather head allowing eighteen (18) feet clearance for any vehicular traffic. A minimum 2-inch diameter weather head and conduit shall be installed to carry cables into the premises, and such conduit shall be continuous into the switch room or other designated point of termination (demarcation point). If the service is via an antenna arrangement on top of the building, then a conduit shall be installed from the base of the antenna location to the point of termination.

In either case, any conduits shall be permitted to have only “sweep” elbows and not over 270 degrees of cumulative directional change between any two cable pulling points. Generally, the conduits shall be continuous from the point of entry into the telecommunications switch room or other designated demarcation point. If the run, from the point of entry into the premises to the demarcation point, is greater than 50 feet, then the entrance cable shall be terminated in a suitable location within 50 feet of the entrance point and a suitable interior cable shall be spliced to it to continue to the demarcation point, unless the entrance cable material meets applicable codes and standards for open

SECTION F - CABLE TELEVISION (CATV)

installation within the premises. If the total “run” of the entrance cable (in conduit) exceeds 250 feet, then a pull box of sufficient size to accommodate the diameter of the telecommunications cable shall be mounted at the nearest point of entry, inside the building.

In all cases, the CATV entrance should parallel the telecommunications entrance if possible. These may be instances where the CATV entrance may share a conduit with the telecommunications entrance cable, and this will be determined on a “case by case” basis.

F.4. Entrance Cable

The CATV entrance cable shall be a 75-ohm coaxial cable, with a physical composition and diameter to be determined by the length of the service entrance run, and designed for underground usage when it is to be used as such. The cable shall be terminated into a coaxial grounding block by one of the two following methods:

1. If the entrance is via underground conduit, then the grounding block shall be located as close as possible to the point of building penetration and shall be grounded to the telecommunications ground or other suitable nearby ground.
2. If the entrance is aerial, then the grounding block shall be located on the outside of the premises, as close as possible to the point of building penetration, and shall be grounded to an outside ground rod.

In either case, the coaxial cable will then continue to the designated point of termination (demarcation point).

F.5. Location

Entrance conduit may enter the switch room or designated point of termination from either below the floor or through the ceiling. In either case, appropriate bushings shall be used in the open ends of the conduit to ensure a smooth edge against the coax, and shall be properly sealed on both ends to ensure no leakage or penetration of water into the switch room after the coax is in place.

Entrance of the conduit into the switch room or designed point of termination should be in a corner location, which will allow a left to right connection of cables to branch extensions that will terminate on an associated backboard. This entrance and the location of the backboard shall be on a wall location other than those used for telecommunications cable and associated frames, blocks or cross-connects.

F.6. Backboard

SECTION F - CABLE TELEVISION (CATV)

The backboard shall be of the same construction, affixed to the walls, and painted in a manner which is consistent with the backboard requirements detailed in other sections of this document.

F.7. Other Runs

Conduit runs carrying coaxial cables to other areas shall exit the switch room via a sleeved conduit(s) (in the same general area as the entrance coax), which shall be sealed in the same manner as the end of the telecommunications entrance conduit(s). Coaxial cable runs to terminal locations shall either be placed in conduit, or the coaxial cable itself shall be fire rated. In those instances where the cables are run in or through any spaces which are used in any way for environmental air, it shall be CMP (National Electric Code Article 800, Plenum Cable) rated cable, and shall be labeled as such.

F.8. Identification and Termination

Cable terminations at the jack or “subscriber” end shall be in standard electrical boxes, using standard F-type “feed thru” connector, and will serve as the CATV outlet for the connection of television equipment. Each outlet shall be assigned an identification label and such label shall be marked or affixed to the cover plate of the outlet. Each cable shall be marked at the switch room, or other designed common termination point, with a tag bearing an identifying label which is identical to the one placed or marked on the far end of such cable. Unless otherwise specified, the cables shall not be “cut down” or connected at the switch room or other designed common termination point, but shall be left with sufficient length to be affixed to the backboard and properly connected to various CATV distribution devices. Unless otherwise specified, all CATV distribution devices shall be supplied and installed by the Office of Information Technology, Network Services Division.

SECTION G - PAGING SYSTEMS

G.1. General

Furnish all labor, materials, equipment, supplies and perform all operations necessary to complete the paging system work, in accordance with the applicable drawings and these specifications. All work must also be done in accordance with the National Electric code any State or Local Building Codes.

G.2. Speakers

All speaker units shall be listed equipment and installed in accordance with the manufacturer's recommendations. Units shall be installed to afford future access to the wiring connections, should the need arise.

G.3. Wiring

All wiring shall consist of the manufacturer suggested cable. Typically, the cable composition will be one (1) shielded pair of 18-gauge copper conductors. A cable shall be run to each speaker unit from the switch room, wiring closet or other area which has been designated to house the paging system switching and amplification equipment. All wiring not in conduit must be fire rated or CMP labeled.

G.4. Identification

The speaker end of each cable should be trimmed to length, dressed and affixed to the speaker unit. The opposite (switch room) end shall be coiled with sufficient length to allow dressing and connection to the switching and amplification equipment, and shall be labeled in a manner that will identify its associated speaker unit.

SECTION H - VIDEO SYSTEMS

ANY REQUIREMENTS FOR VIDEO SYSTEMS WILL BE DEVELOPED SPECIFICALLY FOR EACH PROJECT REQUIRING SUCH SYSTEMS.

SECTION I - MECHANICAL EQUIPMENT

I.1. General

Furnish all labor, materials, equipment, supplies and perform all operations necessary to complete installation of mechanical equipment required for the support of the telecommunications infrastructure, in accordance with the applicable drawings and these specifications. All work must also be done in accordance with the National Electric code any State or Local Building Codes.

I.2. Air Conditioning

There shall be a continuously operating, forced air conditioning and ventilation system servicing the switch room. Should the existing building system be sized and operated in a manner which would allow adequate ventilation and air conditioning of the switch room, as required by the PBX and other telecommunications equipment specifications, then separate feed and return air ducts shall be supplied to the switch room from the existing system. Use the following guidelines for size estimates:

1. Minimum 24,000 BTU/hr of cooling in any room in which a large PBX (approximately 50 stations or more) is to be installed, or when a room size exceeds, by 50 percent, the minimum required space as specified in Section C.
2. Minimum 12,000 BTU of cooling in any room in which a small PBX (approximately 49 stations or less), key system, or any other electronic telecommunications equipment will be installed.

All mechanical equipment shall be listed and certified as to its use and application in this instance and for this specific use. There shall be labeled fire dampers installed in all duct work with a certified fire closing link fuse or other device designed to close off the air flow in the event of such a situation.

In addition to any other installation requirements, the installation of a dedicated air condition system for switch rooms shall be in accordance with the following:

1. Should the design call for an independent, dedicated air conditioning unit for the switch room, then such a unit shall be provided. The unit provided shall be of a recognized, listed brand designed for such an application and shall be installed in such fashion as to prevent any possible leakage of water into the switch room. Therefore, if a water cooled unit is provided, it shall be installed outside the switch room. Should an air cooled unit be provided, it may be installed within the switch room in a location not directly over the PBX or backboard locations.
2. Air conditioners must be powered separately from the switch room electrical service.

SECTION I - MECHANICAL EQUIPMENT

I.3. **Related Electrical Wiring**

All wiring, circuitry and electrical components shall be UL (Underwriters Laboratories) approved and installed in accordance with all codes. All electrical circuits utilized shall be protected by a circuit breaker of sufficient size to support the installation.

SECTION J - FIBER OPTIC CABLE SYSTEMS

J.1. General

Furnish all labor, materials, equipment, supplies and perform all operations necessary to complete the installation of fiber optic cable systems, in accordance with the applicable drawings and these specifications. All work must be performed in accordance with the National Electric Code and any State and Local Building Codes.

ALL WORK INVOLVING FIBER OPTICS MUST BE APPROVED IN WRITING BY THE OFFICE OF INFORMATION TECHNOLOGY, NETWORK SERVICES DIVISION.

J.2. Point of Entry

The entrance to the premises shall be at a point mutually acceptable to the owner and the RBOC/LEC. If cables are to be installed within or between buildings, then such entrances shall be in accordance with general architectural and Office Of Information Technology, Network Services Division plans showing that point closest to the planned location of the optical receiving/transmitting devices.

J.3. Entrance Methods

1. Buried: From the property line closest to the RBOC/CLEC/ILEC facilities, there shall be a conduit(s) buried at a minimum depth of 24 inches, using minimum 2-inch diameter schedule 40 PVC pipe. In areas subject to vehicular traffic, the conduit(s) shall be encapsulated in concrete to a minimum thickness of 3 inches, and running the full length of the traffic area. In all areas where public streets are crossed, rigid steel conduit shall be used. All conduits shall be capped after installation to protect them from weather elements and debris.
2. Aerial: If the electrical power service entrance and other telecommunications service entrances to the premises are aerial, the Architect/Engineer may specify that the fiber optic cable entrance be aerial as well. Any aerial entrance shall be in compliance with the RBOC/CLEC/ILEC requirements. All aerial fiber optic cables must be at least two (2) feet lower than any electrical entrance, and shall carry to a standard weather head allowing eighteen (18) feet clearance for any vehicular traffic. A minimum 2-inch diameter weather head and conduit shall be installed to carry cables into the premises, and such conduit shall be continuous into the switch room or other designated point of termination (demarcation point).

In either case, any conduits shall be permitted to have only “long sweep” elbows and not more than 270 degrees of directional change between any two cable pulling points. Generally, the conduits shall be continuous from the point of entry into the telecommunications switch room or other designated demarcation point.

SECTION J - FIBER OPTIC CABLE SYSTEMS

If the run from the point of entry into the premises to the demarcation point is greater than 50 feet, then the entrance cable shall be terminated in a suitable location within 50 feet of the entrance point, and a suitable interior cable shall be spliced to it to continue to the demarcation point, unless the cable material meets applicable codes and standards for open installation within the premises. If the total “run” of the entrance cable (in conduit) exceeds 150 feet, then a pull box of sufficient size to accommodate the diameter of the telecommunications cable shall be mounted at the nearest point of entry inside the building.

In all cases, the fiber optic cable entrance should parallel the telecommunications entrance if possible. There may be instances where the entrance cable may share a conduit with other telecommunications or CATV entrance cables, and this will be determined on a “case by case” basis. In any case where a conduit is shared with other cables, an innerduct shall be installed in such conduit to carry the fiber optic cable.

J.4. Fiber Optic Cable

The fiber optic cable shall be appropriately sized (numbers of fibers) and shall be appropriate for its intended installation environment, whether underground, aerial, interior (riser), or plenum. Each fiber shall be encapsulated in a color-coded buffer/sheath, the fiber bundle shall be reinforced with a nonmetallic lateral strength member (typically Kevlar), and all shall be sheathed in an overall jacket of appropriate type for the given installation, and as specified by the Network Services Division. Specific fiber optic cable type shall be determined by specific project application. Typical fiber optic types are 50/125 micron (OM3/OM4), 62.5/125 micron (OM1) and 9/125 micron (single-mode). Specific requirements for types of fiber optic cable installations shall be determined on a case-by-case basis and approved by the Office of Information Technology, Network Services Division.

J.5. Location

Entrance conduit may enter the switch room from either below the floor or through the ceiling. In either case, appropriate bushings shall be used in the open ends of the conduit to ensure a smooth edge against the cable, and shall be properly sealed on both ends to ensure no leakage or penetration of water into the switch room after the cable is in place. One entrance of the conduit into the switch room should be in a corner location, allowing a left to right connection to the fiber optic terminal equipment. This entrance and the location of the backboard shall be on a wall location other than those used for other telecommunications cable and associated frames, blocks or cross-connects.

J.6. Backboard

The backboard shall be of the same construction, affixed to the walls, and painted in a manner which is consistent with the backboard requirements detailed in other sections of this document.

SECTION J - FIBER OPTIC CABLE SYSTEMS

J.7. Cable Ingress/Egress, Termination, Splicing

Conduit runs carrying fiber optic cables to other areas shall exit the switch room via a sleeved conduit(s) (in the same general area as the entrance cable), which shall be sealed in the same manner as the end of the telecommunications entrance conduit(s).

Fiber optic cable runs to terminal locations shall either be in dedicated conduits or placed in fiber optic innerduct of dimensions specified by the Network Services Division. Fiber optic cable terminations shall be performed using SC-style fiber connectors, and shall terminate in AT&T/Lucent/Commscope “Lightguide” or equivalent fiber optic terminals that are approved by the Network Services Division. Specific termination connector type shall be determined by the Network Services Division prior to the commencement of such work. All new fiber optic installations and terminations shall use factory pre-polished “pigtailed”, fusion-spliced to the cable.

Fiber splicing is to be performed only with the permission of the Network Services Division. Fiber splicing and termination must only be performed by trained personnel and must be in accordance with industry accepted fiber splicing methods.

J.8. Certification and Identification

All terminated fibers shall be guaranteed by the installer to meet continuity and system design loss criteria. Upon completion of the fiber optic cable system installation, each terminated fiber of all fiber optic cables shall be tested and certified for continuity and end-to-end loss. Supporting documentation which details such test and certification shall be submitted to the Office of Information Technology, Network Services Division upon completion of the project. Each fiber optic cable and each fiber within such cable shall be marked at both termination points to clearly identify the cable, its associated fibers and termination points.

SECTION K - REMOVAL OF OLD CABLE AND FACILITIES

K.1. General

Execute all removal of old telecommunications cable, conduits, racks and other facilities presently existing within the premises, and which will not be reused in any new installation, in accordance with the applicable drawings and these specifications.

K.2. Inspection

The Contractor shall inspect existing conditions with the Office Of Information Technology, Network Services Division to make a determination of what is to be removed and which existing conduits, cables, etc., shall be reused.

K.3. Removal

Removal shall consist of the disconnection of all wiring and/or cables and their subsequent removal by pulling out of conduits, raceways, over ceilings, in crawl spaces or wall cavities, removing surface wiring or cable and any related fastening devices wherever possible. If old wiring and/or cables should be installed in walls, floors or ceilings in such a manner which makes it impossible to remove, then it may be left, with the consent and written permission of Office of Information Technology, Network Services Division. Such wire and/or cable shall be cut as close to the surface as possible and the cut ends taped to prevent accidental reuse, and shall be pushed inside the structure to allow patching and refinishing of the remaining holes. In all cases, removal of telecommunications facilities shall be accomplished in a manner which will allow for a clean, clear surface to remain, i.e., one which can be patched, restored, and painted to match the surrounding conditions without degradation to the premises.

All items shall be removed from the premises in accordance with the general provisions regarding this project, or as the Architect or engineer shall dictate. All waste materials must be disposed of in accordance with any and all applicable local, State, and Federal waste disposal regulations.

SECTION L - CUTTING AND PATCHING

L.1. General

Execute cutting, fitting, and patching (including ground excavation and back fill if needed) and furnish all labor, materials, equipment, supplies, temporary barricades, and covers for equipment/furnishings; and perform all operations necessary to complete the telecommunications project, in accordance with the applicable drawings and these specifications.

L.2. Inspection

The contractor shall inspect conditions, including any and all elements subject to damage, movement, disruption or safety requirements during cutting and patching operations.

L.3. Acceptance

The commencement of cutting or patching means the contractor has accepted existing conditions.

L.4. Protection

Contractor shall provide supports, temporary barricades, covers, or other protective devices to ensure protection of other portions of the project from direct, indirect or incidental damage.

L.5. Restoration

All restoration work shall be accomplished with new materials by the crews or work forces performing the original work on this project, whenever possible.

L.6. Cutting

All cutting of rigid materials shall be accomplished using metal, wood cutting, or masonry saws or core drills. Pneumatic tools shall not be used in occupied buildings without prior approval of the owner.

L.7. Corrosive and Foreign Materials

Whenever conduits, pipes or wiring traverses through walls, and cannot be closed securely for reasons of expansion/contraction, pipe collars shall be used to close the opening as much as possible against dust, dirt, corrosive or foreign materials, or for cosmetic purposes.

SECTION L - CUTTING AND PATCHING

L.8. Finish

All finish work shall be smoothed, sanded, fitted and painted or finished to ensure a cosmetically acceptable, finished product.

L.9. Exterior

Any exterior ground trenching shall be back filled, compacted, and covered to match the preexisting conditions (i.e., gravel, crushed stone, hot top, concrete sidewalk, loam and sod). When excavating through a hot top area, all cuts shall be “saw cut” and “infrared bondings” shall be used when replacing hot top materials.

SECTION M – TEMPORARY UTILITIES

M.1. General

Furnish all necessary labor, materials, equipment, supplies and perform all operations necessary to provide temporary heat, lights, and power for any telecommunications activities for the duration of the project.

M.2. Supervision

The contractor shall allow Owner/Lessee-supervised telecommunications installers, technicians or service personnel, including telecommunications contractor(s) under contract to the owner/Lessee, to enter the premises and to perform required telecommunications installations, repairs, and modifications.

M.3. Temporary Measures

All telecommunications activities performed under this section shall be provided with temporary heat and toilet/ sanitary facilities as deliverable and available to the balance of the project, as well as temporary lighting and power outlets as required, until such permanent utilities and fixtures become available for use.

M.4. Coordination

Telecommunications contractors and personnel under control of the Owner/Lessee shall coordinate all activities and hours of working with the contractor or subcontractor responsible for the completion of the telecommunications portion of this project.

M.5. Protection

The contractor shall take all steps required to secure and protect telecommunications equipment, supplies and tools placed in the premises and not part of this contract. Such protection shall include, but is not necessarily limited to, security, temporary covers, barricades, and space heating.

M.6. Safety

The contractor shall provide and install all temporary measures necessary to protect the safety of all pedestrian and/or vehicular traffic during any internal or external construction activities in which the contractor is engaged. Such safety measures shall include, but shall not be limited to warning signs, banners, ribbons, barricades, fences, ropes, reflectors or lights. All temporary safety measures installed by the contractor shall be removed when work is completed and when no further work area hazards exist.

SECTION N – PAINTING AND CLEANUP

N.1. General

Furnish all labor materials, equipment, supplies and perform all operations necessary to complete the painting and cleanup of all telecommunications activities, in accordance with the applicable drawings and these specifications.

N.2. Coordination

The telecommunications contractor(s) shall coordinate with the general contractor for the entire project or premises to ensure completion of all work in accordance with these plans and specifications.

N.3. Painting

Final painting shall be accomplished with color selection being determined either by requirements to match existing work, or as directed by the contractor/subcontractor responsible for painting and interior finish work for the entire project.

N.4. Rubbish Removal

At the completion of the telecommunications work, all trash, scrap materials, broken or discarded construction materials, boxes, cartons, scrap wire/cable, empty containers, temporary barricades, safety devices, temporary utility connections, shall be removed from the work areas or otherwise moved or placed at the direction of the general contractor responsible for the total project. All waste materials must be disposed of in accordance with any and all applicable local, State and Federal waste disposal regulations.

N.5. Cleanup

All areas involved in the scope of the telecommunications plans and specifications shall be swept clean, floors mopped down, and floor finish applied, as required. All hand smudges, paint droppings or other noticeable defects that would affect the cosmetic appearance of the project, shall be corrected to the satisfaction of the general contractor, and the architect/engineer on the project.

SECTION O – SPECIAL SERVICES AND FACILITIES

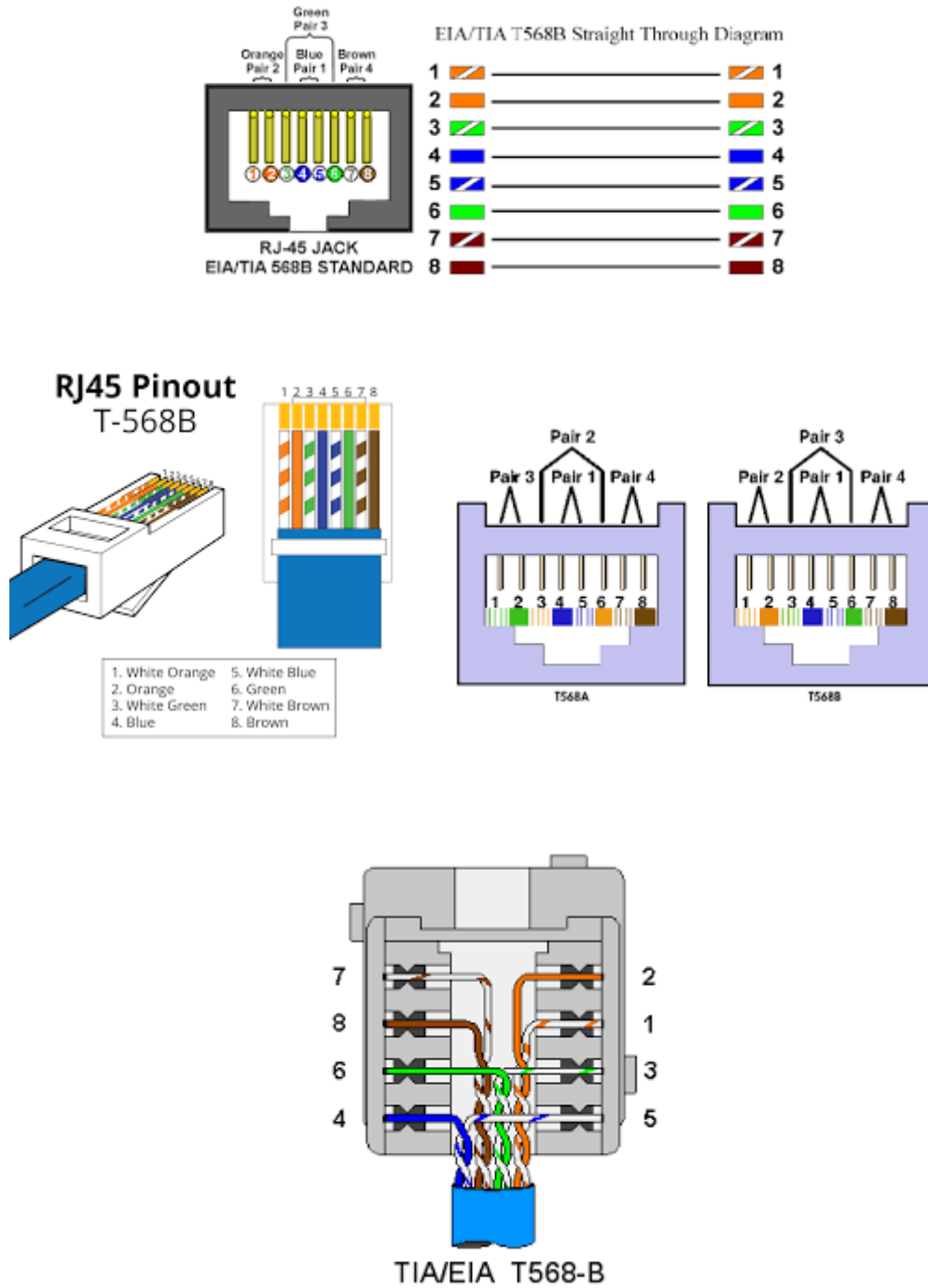
ANY REQUIREMENTS FOR SPECIAL TELECOMMUNICATIONS SERVICES AND/OR FACILITIES WILL BE DEVELOPED SPECIFICALLY FOR EACH PROJECT REQUIRING SUCH SERVICES AND/OR FACILITIES.

APPENDIX

VOICE / DATA OUTLET WIRING DETAILS (EIA/TIA 568B).....	I
TYPICAL BUILDING TELECOMMUNICATIONS MDF/IDF ROOM LAYOUT.....	II
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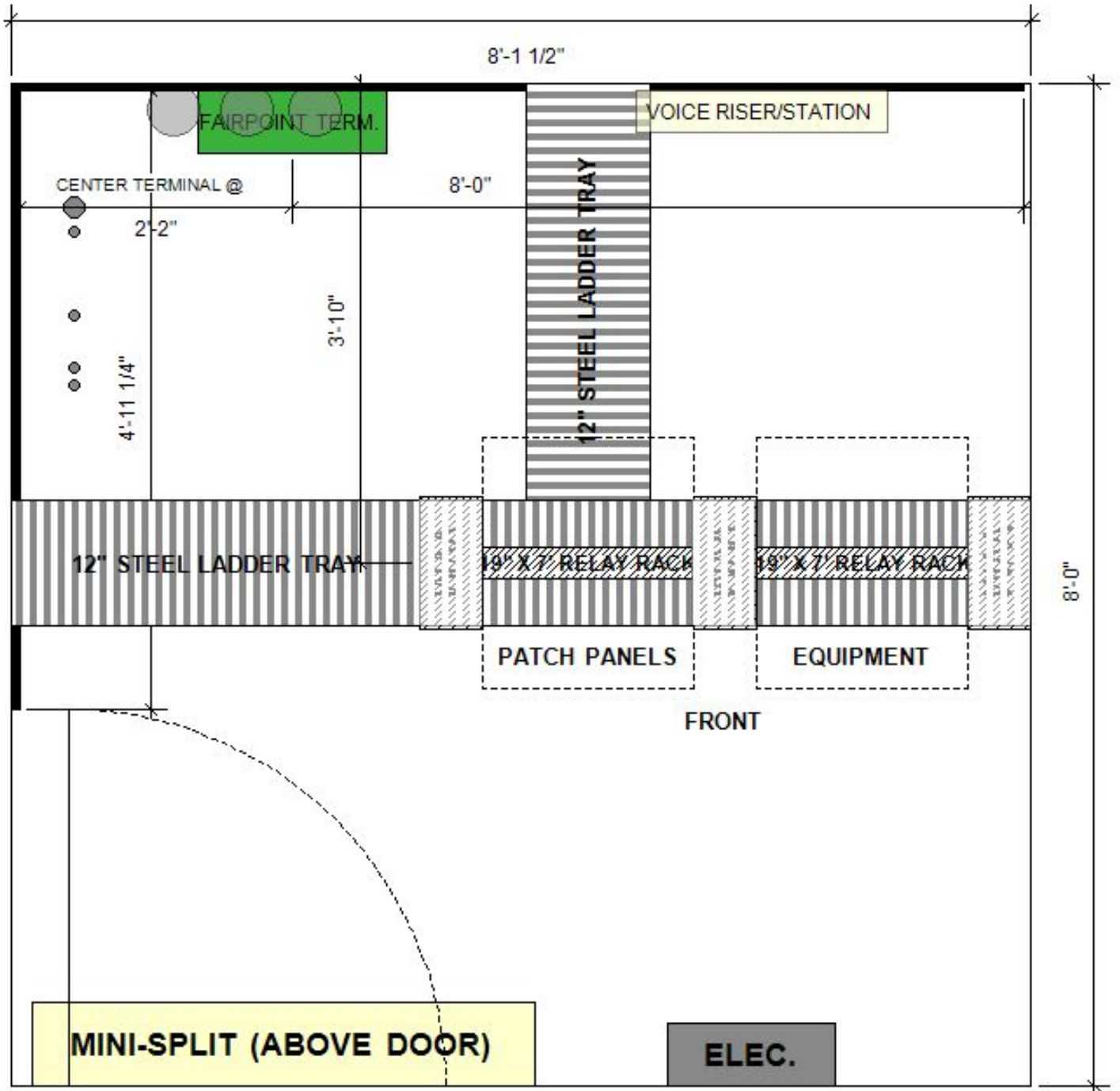
APPENDIX

TELECOMMUNICATIONS VOICE AND DATA OUTLET WIRING CONFIGURATION FOR EIA/TIA 568B STANDARD



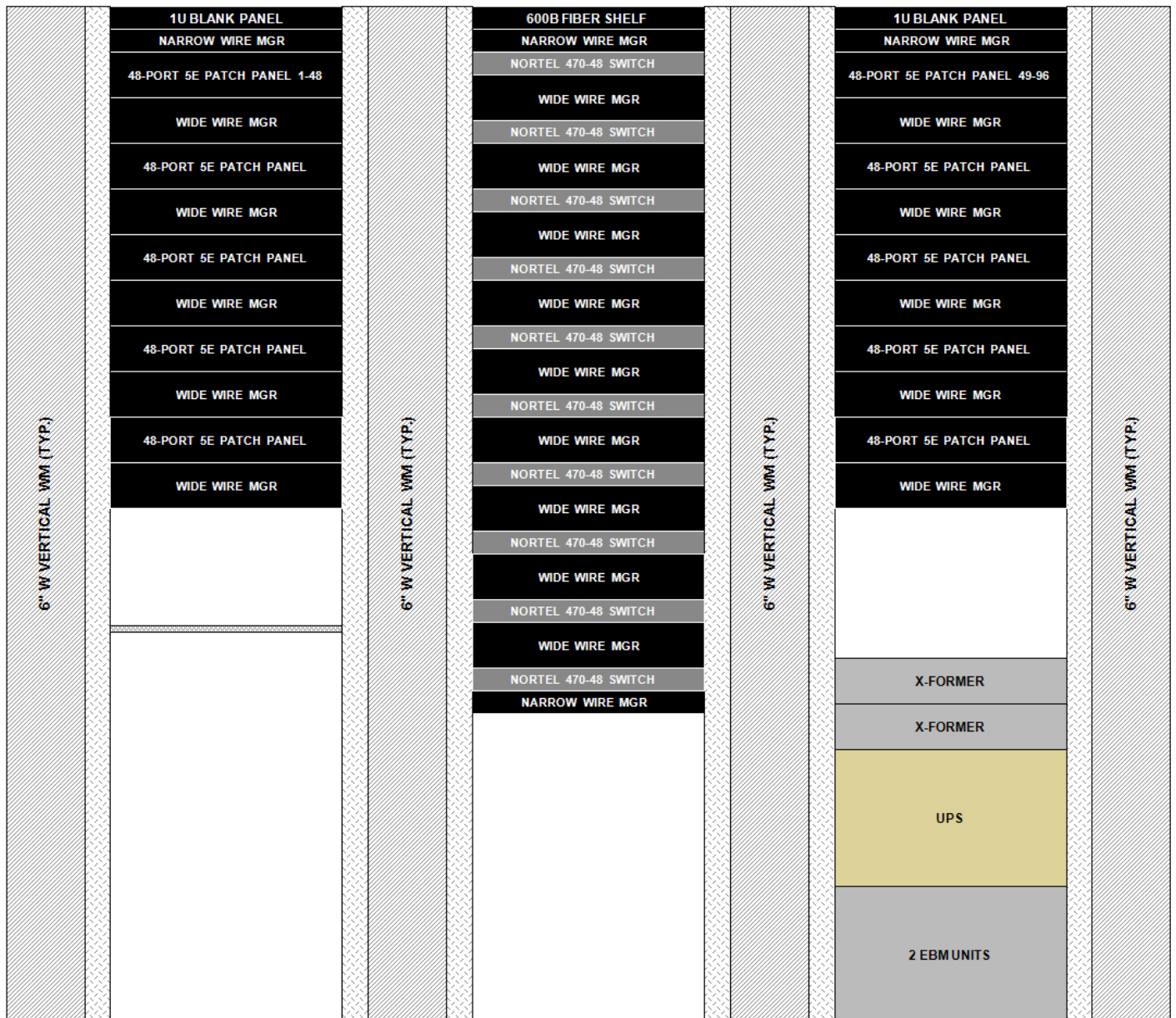
APPENDIX

TYPICAL BUILDING TELECOMMUNICATIONS MDF/IDF ROOM LAYOUT PLAN VIEW (MID-SIZE)



APPENDIX

TYPICAL TELECOMMUNICATIONS MDF/IDF (SWITCH ROOM) RACK LAYOUT
FOR
A RELATIVELY LARGER BUILDING

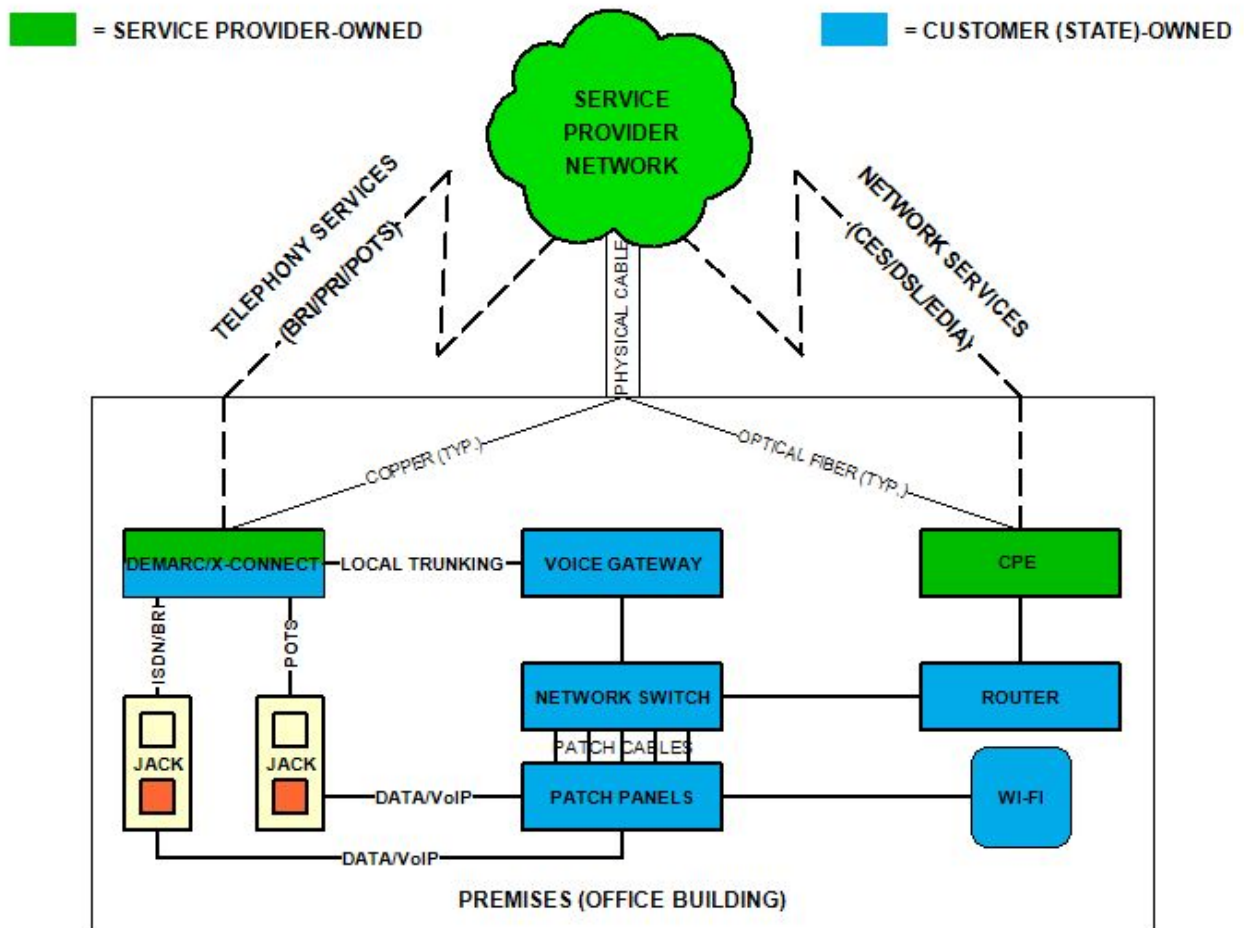


THREE-RACK LAYOUT (TYP.)

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TELECOMMUNICATIONS FACILITIES & WIRING SPECIFICATIONS
REV 6.1/11/15

APPENDIX

TYPICAL TELECOMMUNICATIONS LOGICAL CONNECTIVITY DIAGRAM



SECTION 311000 – SITE CLEARING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Clearing and protection of vegetation.
- B. Removal of existing debris.

1.2 QUALITY ASSURANCE

- A. Clearing Firm: Company specializing in the type of work required.

PART 2 - EXECUTION

2.1 SITE CLEARING

- A. Comply with other requirements specified in Section 017000.
- B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

2.2 EXISTING UTILITIES AND BUILT ELEMENTS

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Protect existing structures and other elements that are not to be removed.

2.3 VEGETATION

- A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, gravel, lawns, and planting beds.
- B. Do not begin clearing until vegetation to be relocated has been removed.
- C. Do not remove or damage vegetation beyond the limits indicated on drawings.
 - 1. 10 feet outside the building perimeter.
 - 2. 5 feet each side of surface walkways, patios, surface parking, and utility lines less than 12 inches in diameter.
 - 3. 10 feet each side of roadway curbs and main utility trenches.
 - 4. Exception: Specific trees and vegetation indicated on drawings to be removed.
 - 5. Exception: Selective thinning of undergrowth specified elsewhere.
- D. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
 - 1. At vegetation removal limits.
 - 2. Around trees to remain within vegetation removal limits; locate no closer to tree than at the drip line.
 - 3. Around other vegetation to remain within vegetation removal limits.
- E. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.
- F. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.

1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
 2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
 3. Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
 4. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
 5. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.
- G. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

2.4 DEBRIS

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF DOCUMENT 311000

SECTION 311213 - SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Building demolition excluding removal of hazardous materials and toxic substances.
2. Demolition and removal of selected site improvements.
3. Removing below-grade construction.
4. Disconnecting, capping or sealing, and removing site utilities as indicated.
5. Salvaging items for reuse by Owner.

1.2 DEFINITIONS

- A. Demolish: Completely remove and legally dispose of off-site.
- B. Recycle: Recovery of demolition waste for subsequent processing in preparation for reuse.
- C. Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse. Include fasteners or brackets needed for reattachment elsewhere.

1.3 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
1. Carefully salvage in a manner to prevent damage and promptly return to Owner.
- C. All items indicated on the drawings to be "Salvage" shall remain the property of the Owner and stored and delivered per direction of Owner's Representative.

1.4 SUBMITTALS

- A. Schedule of Site Demolition Activities: Indicate the following:
1. Detailed sequence of demolition work, with starting and ending dates for each activity.
 2. Temporary interruption of utility services.
 3. Shutoff and capping of utility services.
- B. Site Plan showing the following:

1. Areas for temporary construction and field offices.
 2. Areas for temporary and permanent placement of removed materials.
- C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
 2. Identify demolition firm and submit qualifications.
 3. Include a summary of safety procedures.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.
- E. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI A10.6 and NFPA 241.
- C. Demolition Firm Qualifications: Company specializing in the type of work required.
1. Minimum of 5 years of documented experience.

1.6 PROJECT CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.
- B. Conduct site demolition so operations of adjacent occupied buildings will not be disrupted.
1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent buildings or facilities.
 2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
 - a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction and Owner's Representative.
- C. Owner assumes no responsibility for building structures and utilities to be demolished.
1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 2. Before site demolition, Owner will remove wanted items.

- D. Hazardous Materials: Hazardous material assessment has been made for this project. A report on the findings is included in Section 003100 "Available Project Information" and Appendix. Examine reports to become aware of locations where hazardous materials are present.
 - 1. Hazardous material remediation is specified elsewhere in the Contract Documents.
 - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
- E. On-site storage of removed items or materials is not permitted without the permission of the Owner's Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Fill Material: As specified in Section 312323 - Fill.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
- B. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.
- C. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.
- D. Verify that hazardous materials have been remediated before proceeding with site demolition operations.

3.2 PREPARATION

- A. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings, structures, and utilities to be demolished.
 - 1. Owner will arrange to shut off indicated utilities when requested by Contractor.
 - 2. Arrange to shut off indicated utilities with utility companies.
- B. Salvaged Items: Comply with the following:
 - 1. Clean salvaged items of dirt and demolition debris.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to storage area indicated on Drawings or as directed by the Owner's Representative.

5. Protect items from damage during transport and storage.

3.3 PROTECTION

- A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings at all times.
- B. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.
 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner's Representative and authorities having jurisdiction.
 2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner's Representative and authorities having jurisdiction.
 - a. Provide at least 72 hours' notice to occupants of affected buildings if shutdown of service is required during changeover.
- C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Division 01 Section "Temporary Facilities and Controls."
 1. Protect adjacent buildings and facilities from damage due to demolition activities.
 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
 6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
 7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.
- D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.4 DEMOLITION, GENERAL

- A. General: Demolish indicated existing buildings, site structures, and site improvements completely or to the limits indicated on the drawings. Use methods required to complete the Work within limitations of governing regulations and as follows:
 1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
 2. Maintain fire watch during and for at least 8 hours after flame cutting operations.

3. Maintain adequate ventilation when using cutting torches.
 4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- C. Explosives: Use of explosives is not permitted.
- D. Salvage: Items to be salvaged are indicated on Drawings.
- E. Below-Grade Construction: Demolish foundation walls and other below-grade construction that are within footprint of new construction and extending 5 feet (1.5 m) outside footprint indicated for new construction. Abandon below-grade construction outside this area.
1. Remove below-grade construction, including basements, foundation walls, and footings, to depths indicated.

3.5 SCOPE

- A. Remove the entire building designated on the site plan.
- B. Remove paving and curbs as required to accomplish new work.
- C. Remove all other paving and curbs within site boundaries.
- D. Break up paving within site boundaries to permit natural moisture drainage; leave pieces not larger than 1 square yard.
- E. Within area of new construction, remove foundation walls and footings to a minimum of 2 feet below finished grade.
- F. Outside area of new construction, remove foundation walls and footings to a minimum of 2 feet below finished grade.
- G. Remove concrete slabs on grade within site boundaries.
- H. Break up concrete slabs on grade within site boundaries to permit natural moisture drainage; leave pieces not larger than 1 square yard.

- I. Remove underground tanks.
- J. Remove underground tanks that contain or once contained petroleum products; fill and bury other types of tanks.
- K. Remove manholes and manhole covers, curb inlets and catch basins.
- L. Remove fences and gates.
- M. Remove creosote-treated wood utility poles.
- N. Remove other items indicated, for salvage, relocation, and recycling.
- O. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Section 312200.

3.6 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with other requirements specified in Section 017000.
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Comply with applicable requirements of NFPA 241.
 - 3. Use of explosives is not permitted.
 - 4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 5. Provide, erect, and maintain temporary barriers and security devices.
 - 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - 7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 8. Do not close or obstruct roadways or sidewalks without permit.
 - 9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
 - 10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- C. Do not begin removal until receipt of notification to proceed from Owner.
- D. Do not begin removal until built elements to be salvaged or relocated have been removed.
- E. Do not begin removal until vegetation to be relocated has been removed and specified measures have been taken to protect vegetation to remain.
- F. Protect existing structures and other elements that are not to be removed.

1. Provide bracing and shoring.
 2. Prevent movement or settlement of adjacent structures.
 3. Stop work immediately if adjacent structures appear to be in danger.
- G. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- H. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.
- I. Perform demolition in a manner that maximizes salvage and recycling of materials.
1. Comply with requirements of Section 017419 - Waste Management.
 2. Dismantle existing construction and separate materials.
 3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.
- J. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.7 EXISTING UTILITIES

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.8 SITE RESTORATION

- A. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with acceptable materials according to backfill requirements in Division 31 Section "Fill."

- B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.9 REPAIRS

- A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.10 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill acceptable to authorities having jurisdiction.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Do not burn demolished materials.

3.11 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

END OF DOCUMENT 311213

SECTION 312319 – DEWATERING

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Furnish, operate and maintain dewatering equipment for control, collection, and disposal of ground and surface water entering trenches and excavations.

1.2 RELATED SECTIONS

- A. Section 312316 - Excavation
- B. Section 312323 - Fill
- C. Section 312316.13 - Trenching.
- D. Section 311000 - Site Clearing
- E. Section 312500 - Slope Protection and Erosion Control.

1.3 DESIGN REQUIREMENTS

- A. Design dewatering facilities including drains, piping and pumping.

1.4 SUBMITTALS

- A. Prior to start of excavation and trenching, submit dewatering design and methods to Owner for review.

PART 2 – PRODUCTS

2.1 EQUIPMENT

- A. Provide pumps, drains, piping and other facilities necessary to keep excavations and trenches free of water including spare units available for immediate use in the event of equipment failure.

PART 3 – EXECUTION

3.1 PROTECTION

- A. Protect watercourses, sewer systems and adjacent properties from siltation by use of sediment ponds or other measures acceptable to Owner.
- B. Keep excavations clear of groundwater, surface water, seepage, sewage and stormwater.
- C. Follow all dewatering procedures outlined in the Environmental Media Management Plan.

3.2 INSTALLATION

- A. Install, construct and maintain equipment and facilities required for work of this section.
- B. Dispose of water removed from Work in a suitable manner which will not interfere with other work, cause erosion, damage pavements, other surfaces or property and is acceptable to Owner.
- C. Remove dewatering equipment and facilities when no longer required.
- D. Backfill excavations in accordance with 312316 and 312316.13.
- E. Repair damage resulting from dewatering operations.

- F. Dewatering costs shall be included in bid and no separate payment shall be made.

END OF DOCUMENT 312319

SECTION 312200 – GRADING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Removal of topsoil.
- B. Rough grading the site for site structures.
- C. Finish grading.

1.2 RELATED REQUIREMENTS

- A. Section 311000 - Site Clearing.
- B. Section 312316 - Excavation.
- C. Section 312323 - Fill: Filling and compaction.
- D. Section 312316.13 - Trenching: Trenching and backfilling for utilities.
- E. Section 312316.26 - Rock Removal.

1.3 SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.
- B. Contaminated soil cap and cover system shall be documented on the project record drawings.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with State of Maine Bureau of Parks and Lands Standards.

1.5 PROJECT CONDITIONS

- A. Protect above- and below-grade utilities that remain.
- B. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.
- C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from grading equipment and vehicular traffic.
- D. All earthwork and/or disturbance of site soils should be conducted in accordance with the Environmental Media Management Plan and the Health and Safety Plan.
- E. The entire project area is subject to the cap and cover requirements of the EMMP, including but not limited to an indication layer with 12" of clean imported material, or covered with pavement/buildings. Refer to the EMMP for additional information.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Other Fill Materials: See Section 312323.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.
- B. Verify the absence of standing or ponding water.

3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect from damage above- and below-grade utilities to remain.
- D. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.

3.3 ROUGH GRADING

- A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
- B. Contaminated soils as described in the Environmental Media Management Plan may be used for rough grading if covered by an indication barrier and a minimum of 12" of clean fill/topsoil and the area is seeded. See the EMMP for additional information.
- C. Do not remove topsoil when wet.
- D. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.
- E. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.
- F. When excavating through roots, perform work by hand and cut roots with sharp axe.
- G. See Section 312323 for filling procedures.
- H. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.
- I. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.

3.4 SOIL REMOVAL

- A. Stockpile excavated topsoil on site.
- B. Stockpile excavated subsoil on site.
- C. Temporary stockpiles of contaminated soils shall be placed on and covered by polyethylene sheeting. The soil stockpiles shall be inspected daily to ensure the covering is undamaged, erosion control measures are intact/functioning properly, and stormwater runoff is directed away from them. An inspection log shall be maintained, with deficiencies notes in the log, and repaired immediately.
- D. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.
- E. Contaminated soil removed from the site shall be disposed of in accordance with the EMMP.

3.5 FINISH GRADING

- A. Before Finish Grading:
 - 1. Verify building and trench backfilling have been inspected.
 - 2. Verify subgrade has been contoured and compacted.
- B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.

- C. Where topsoil is to be placed, scarify surface to depth of 4 inches.
- D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 4 inches.
- E. Place topsoil in areas indicated.
- F. Place topsoil during dry weather.
- G. Remove roots, weeds, rocks, and foreign material while spreading.
- H. Near plants spread topsoil manually to prevent damage.
- I. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
- J. Lightly compact placed topsoil.
- K. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.6 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.
- B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).
- C. Top Surface of Subgrade: Plus or minus 1/10 foot from required elevation.
- D. Top Surface of Finish Grade: Plus or minus 1/2 inch.

3.7 FIELD QUALITY CONTROL

- A. See Section 312323 for compaction density testing.

3.8 CLEANING

- A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.
- B. Leave site clean and raked, ready to receive landscaping.
- C. Protect newly graded areas from traffic and erosion and keep free of trash and debris.
- D. Repair and re-establish grades in settled, eroded and rutted areas within specified tolerances.
- E. Slope fill surfaces to shed water.

END OF DOCUMENT 312200

SECTION 312316 – EXCAVATION

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Excavating for building volume below grade, footings, pile caps, slabs-on-grade, paving, site structures, and utilities within the building.

1.02 RELATED REQUIREMENTS

- A. Geotechnical Engineering Report – There is no geotechnical engineering report for this project.
- B. Environmental Media Management Plan (EMMP) – There is no EMMP for this project.
- C. Section 312200 - Grading: Soil removal from surface of site.
- D. Section 312323 - Fill: Fill materials, backfilling, and compacting.
- E. Section 312316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.
- F. Section 312316.26 - Rock Removal: Removal of rock during excavating.

1.03 PROJECT CONDITIONS

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.01 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. See Section 312200 for topsoil removal.
- C. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Engineer.

3.02 EXCAVATING

- A. Underpin adjacent structures that could be damaged by excavating work.
- B. Excavate to accommodate new structures and construction operations.
- C. Notify Site Engineer and Geotechnical Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- D. Excavate materials encountered when establishing required subgrade elevations in accordance with (MDOT) Specification Section (203.04 and 203.05)
- E. Conform to elevations, contours, dimensions, line and grade shown on the Drawings.
- F. When excavation through roots is necessary, perform work by hand and cut roots with a sharp axe.
- G. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored. All excavations shall be consistent with OSHA regulations.

- H. Do not interfere with 45 degree bearing splay of foundations.
- I. Do not excavate wet subsoil.
- J. Remove all existing fill soils from beneath foundations.
- K. Cut utility trenches wide enough to allow inspection of installed utilities.
- L. Hand trim excavations. Remove loose matter.
- M. Remove lumped subsoil, boulders, solid mortared stone masonry, concrete masonry and rock up to 2 cu yd measured by volume. See Section 312316.26 for removal of larger material.
- N. Relic foundations shall be removed to a depth of at least 2 feet below proposed finished grades in paved areas. Removal of relic foundations is incidental to the contract and will not be paid for under rock excavation.
- O. Correct areas that are over-excavated and load-bearing surfaces that are disturbed at no cost to Owner; see Section 312323.
- P. Provide temporary means and methods, as required, to remove all water from excavations until directed by Engineer. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.
- Q. Determine the prevailing groundwater level prior to excavation. If the proposed excavation extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Engineer. If the proposed excavation extends more than 1 foot into the excavation, control groundwater intrusion with a comprehensive dewatering procedures, or as directed by the Geotechnical Engineer.
- R. Remove excavated material that is unsuitable for re-use from site.
- S. Surplus Material:
 - 1. Make arrangements to provide suitable disposal areas off-site.
 - 2. Deposit and grade material to the satisfaction of the owner of the property on which the material is deposited.
 - 3. Obtain any necessary permits for disposal.
 - 4. Provide suitable watertight vehicles to haul soft or wet materials over streets or pavements to prevent deposits on same.
 - 5. Keep crosswalks, streets, and pavements clean and free of debris.
 - 6. Clean up materials dropped from vehicles as often as directed by Owner.

3.03 FIELD QUALITY CONTROL

- A. Provide for visual inspection of load-bearing excavated surfaces by Engineer before placement of foundations.

3.04 PROTECTION

- A. Divert surface flow from rains or water discharges from the excavation.
- B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.
- D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- E. Keep excavations free of standing water and completely free of water during concrete placement.

Wolfe's Neck Woods State Park
Freeport, Maine

SECTION 312316
EXCAVATION

END OF DOCUMENT 312316

SECTION 312316.13 – TRENCHING

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Excavating trenches and backfill for utilities, including underslab utilities.
- B. Excavating for manholes, catch basins and other structures.
- C. Compacted bedding and compacted backfilling over utilities to subgrade elevations.
- D. Compacted base and compacted backfilling for manholes, catch basins and other structures to subgrade elevations.
- E. Compaction requirements.
- F. Dust control.

1.02 RELATED REQUIREMENTS

- A. Section 312200 - Grading: Site grading.
- B. Section 312316 - Excavation: Building and foundation excavating.
- C. Section 312323 - Fill: Backfilling at building and foundations.
- D. Section 312316.26 - Rock Removal: Removal of rock during excavating.

1.03 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.
- B. Subgrade Elevations: Indicated on drawings or the bottom of aggregate subbase gravel in paved areas, the bottom of aggregate base gravel in sidewalk areas, the bottom of loam in seeded areas, or to 1 foot below finished floor elevation.

1.04 REFERENCE STANDARDS

- A. State of Maine Department of Transportation Standard Specifications, Latest Edition.
- B. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; 2010.
- C. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.
- D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012.
- E. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.
- F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012.
- G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.
- H. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
- I. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.

- J. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.
- K. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.

1.05 SUBMITTALS

- A. Samples: 10 pound sample of each type of fill; submit in air-tight containers to testing laboratory.
- B. Materials Sources: Submit name and location of imported materials source.
- C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- D. Compaction Density Test Reports.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where designated.
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.
- C. Protect excavations by shoring, bracing, sheet piling, underpinning or other methods required to prevent cave-in or loose soil from falling into excavation.
- D. Protect above or below grade utilities which are to remain. Repair any damage caused by construction of this project at no cost to Owner.
- E. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.
- F. Protect excavations and soil adjacent to and beneath foundations from frost.
- G. Grade excavation top perimeter to prevent surface water runoff into excavations.
- H. Maintenance of existing flows:
 - 1. Keep existing sewers and drains in operation.
 - 2. If existing sewers and drains are disturbed, provide for maintenance of such flows until work is completed.
 - 3. Do not allow raw sewage to flow on ground surface or stand in excavation.
- I. The contractor is responsible for obtaining and complying with the necessary utility permits from the (water/sewer company). Applicable fees are to be included in bid.

PART 2 - PRODUCTS

2.01 FILL MATERIALS

Refer to Section 312323 for Fill Materials.

2.02 ACCESSORIES

- A. Geotextile Fabric: Non-biodegradable, non-woven, Mirafi 140N.
- B. Water for sprinkling: Fresh and free from oil, acid and injurious alkali or vegetable matter.
- C. Calcium chloride: ASTM D98 commercial grade except as waived by the Owner.

2.03 SOURCE QUALITY CONTROL

- A. If tests indicate materials do not meet specified requirements, change material and retest. Materials not meeting specified requirements, if used prior to acceptance, shall be removed and replaced at no cost to Owner.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench marks and intended elevations for the work are as indicated.
- B. Identify required lines, levels, contours, and datum locations.
- C. See Section 312200 for additional requirements.
- D. Examine the areas and conditions under which excavating and filling is to be performed and notify Owner in writing of conditions detrimental to proper and timely completion of work.
- E. Correct unsatisfactory conditions in a manner acceptable to Owner prior to proceeding with work.
- F. Maintain in operating condition existing utilities, active utilities and drainage systems encountered in utility installation.
- G. Locate, identify, and protect utilities that remain and protect from damage.
- H. Notify utility company to remove and relocate utilities.
- I. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- J. Protect plants, lawns, rock outcroppings, and other features to remain.

3.02 INSPECTION

- A. Verify stockpiled fill to be used is approved.
- B. Verify areas to be backfilled are free of organics, debris, snow, ice or water, and surfaces are not frozen.

3.03 GENERAL REQUIREMENTS

- A. See Section 312316 for additional requirements.
- B. Provide trenching and backfilling for storm drain, water service, sewerage pipes, conduits and structures. Water and sewerage lines separation shall be minimum 10 feet horizontally and 18 inches vertically. Lay all piping in open trench. Maintain access to fire hydrants by fire-fighting equipment.
- C. Sheet and brace trenches and remove water as necessary to fully protect workmen and adjacent facilities, in keeping with local regulations or, in the absence thereof, with the provisions of the "Manual of Accident Prevention in Construction," of the Associated General Contractors of America, Inc. Under no circumstances lay pipe or install appurtenances in water. Keep the trench free from water until pipe joint material has hardened. Sheet piling left in place shall be cut off not less than 2 feet below finished grade. Sheet piling shall not be removed until the trench is substantially backfilled.
- D. Excavation under this contract shall be unclassified.
- E. Grade the bottom of the trenches evenly to ensure uniform bearing for full length of all pipes. Excavate all rock, cemented gravel, old masonry, or other hard material to at least 6 inches

below the pipe at all points. Refill such space and all other cuts below grade with sand bedding or fine gravel firmly compacted.

- F. Should soil conditions necessitate special supports for piping and/or appurtenances, including the removal of unsuitable material and refilling with sand bedding or fine gravel, such work shall be performed as necessary.
- G. Backfill trenches only after piping has been inspected, tested and the locations of pipe and appurtenances have been recorded. Backfill by hand around pipe and for a depth of 1 foot above the pipe. Use earth without rock fragments or large stones and tamp as specified in layers not exceeding 6 inches in thickness, taking care not to disturb the pipe or damage the pipe coating. Compact the remainder of the backfill as specified with a rammer of suitable weight, or with an approved mechanical tamper, provided that under pavements, walks and other surfacing, the backfill shall be tamped as specified. Exclude all cinders, rubbish and scrap metal from trenches in which metal pipes are laid. Special care shall be used to properly tamp backfill under lower half of sewer pipe.

3.04 PREPARATION

- A. Identify known underground utilities. Stake and flag locations.
- B. Identify and flag surface and aerial utilities.
- C. Notify utility companies of work to be done.
- D. When necessary, compact subgrade surfaces to density requirements for embankment, aggregate base, and aggregate subbase materials.
- E. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Type 'B' underdrain sand backfill and compact to density equal to requirements for subsequent backfill material.
- F. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.05 TRENCHING

- A. Notify Site Engineer and Geotechnical Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored. All excavations shall be consistent with OSHA requirements.
- C. Do not interfere with 45 degree bearing splay of foundations.
- D. Excavate subsoil required for piping and appurtenances.
- E. Cut trenches wide enough to allow inspection of installed utilities.
- F. Relic topsoil, if encountered in utility trenches shall be removed from beneath pipes and pipe bedding.
- G. Hand trim excavations. Remove loose matter.
- H. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.
- I. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard measured by volume. See Section 312316.26 for removal of larger material.
- J. Remove excavated material that is unsuitable for re-use from site.
- K. Stockpile excavated material to be re-used in area designated in Section 312200.
- L. Correct unauthorized excavation with Sand Bedding, (Type B Underdrain Sand or Type C Underdrain Stone) or as directed by Owner.

- M. Fill over-excavated areas under pipe bearing surfaces with Sand Bedding, (Type B Underdrain Sand or Type C Underdrain Stone) or as directed by Owner.
- N. Do not store excavated material adjacent to excavations where they could surcharge side slopes.
- O. Remove excess excavated material from site.
- P. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Engineer. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.
- Q. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Engineer.
- R. Surplus Material:
 - 1. Make arrangements to provide suitable disposal areas off-site.
 - 2. Deposit and grade material to the satisfaction of the owner of the property on which the material is deposited.
 - 3. Obtain any necessary permits for disposal.
 - 4. Provide suitable watertight vehicles to haul soft or wet materials over streets or pavements to prevent deposits on same.
 - 5. Keep crosswalks, streets, and pavements clean and free of debris.
 - 6. Clean up materials dropped from vehicles as often as directed by Owner.

3.06 PREPARATION FOR UTILITY PLACEMENT

- A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.07 ELECTRICAL/TELEPHONE

- A. Refer to the Handbook of Standard Requirements for Electric Service and Meter Installation for installation requirements for primary electric service, secondary electric service, telephone service and cable services. Pull ropes shall be installed in all conduits.

3.08 REPAIRS TO EXISTING PIPES, CONDUIT AND WATER LINES

- A. Remove damaged or broken portions of pipe or conduit and replace with a pipe or conduit of the same size and material, unless otherwise directed by Owner, designed to serve same function as existing pipe or conduit.
- B. Make connections for repair with flexible couplings to satisfaction of Owner.
- C. Maintain inventory of suitable repair materials on site.
- D. Make repairs immediately following discovery of damage.
- E. Do not backfill until repairs have been completed to satisfaction of Owner.
- F. Repairs to water mains and services will be by the water utility. Coordination and payment for repairs shall be the responsibility of the Contractor.

3.09 BACKFILLING

- A. Backfill to contours and elevations indicated using unfrozen materials.
- B. Place and compact bedding material to grade of underside of pipe in trench bottom as soon as excavation reaches grade.
- C. Compact bedding material to provide firm laying base.

- D. Underslab utilities shall be installed on sand bedding material and backfilled with sand backfill.
- E. After pipe is laid to grade, place bedding material uniformly on each side of pipe up to spring line while carefully compacting bedding material under haunches of pipe.
- F. Support pipe and conduit during placement and compaction of bedding fill.
- G. Place and compact base material to grade of underside of appurtenant structures in bottom of excavation as soon as excavation reaches grade.
- H. Compact base material for appurtenant structures to provide a firm laying base.
- I. Place and compact backfill materials in continuous layers not exceeding 12 inches in area of paving, slabs-on-grade, and similar construction. Lift thickness not to exceed 16 inches in lawn or field areas.
- J. Install geotextile fabric in accordance with manufacturer's recommendations and where shown on Drawings
- K. Employ a placement method that does not disturb or damage other work.
- L. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- M. Maintain optimum moisture content of fill materials to attain required compaction density.
- N. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- O. Correct areas that are over-excavated.
 - 1. Thrust bearing surfaces: Fill with concrete.
 - 2. Other areas: Use common borrow in lawn areas or granular borrow in paved/building areas, flush to required elevation, compacted to minimum 95 percent of maximum dry density.
- P. Leave stockpile areas completely free of excess fill materials.
- Q. Upon completion of backfilling in paved areas, sweep undisturbed pavement.
- R. Upon request of Owner implement the following dust control measures during the interim period between backfilling and capping of the trench:
 - 1. Apply water and calcium chloride as directed by Owner.
 - 2. Spread calcium chloride uniformly over designated areas.
 - 3. Apply water with equipment having a tank with pressure pump and nozzle equipped spray bar acceptable to Owner.
- S. Compaction Density Unless Otherwise Specified or Indicated:
 - 1. Under paving, slabs-on-grade, and similar construction: 95 percent of maximum dry density.
 - 2. At other locations: 90 percent of maximum dry density.
- T. Reshape and re-compact fills subjected to vehicular traffic.

3.10 TOLERANCES

- A. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.11 FIELD QUALITY CONTROL

- A. Compaction density testing will be performed on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.
- B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor"), AASHTO T 180, or ASTM D698 ("standard Proctor").

- C. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.
- D. Frequency of Tests: 1 test for each 200 feet of trench for the first and every other lift of compacted trench backfill not including pipe bedding.

3.12 CLEANING

- A. Leave unused materials in a neat, compact stockpile.
- B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF DOCUMENT 312316.13

SECTION 312316.26 - ROCK REMOVAL

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Removal of identified rock during excavation.

1.02 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete.
- B. Section 312323 - Fill: Fill materials.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Site Rock Removal: By the cubic yard measured before disintegration. Includes preparation of rock for removal, explosive disintegration of rock, removal from position, loading and removing from site. For over excavation, payment will not be made for over excavated work nor for replacement materials.
- B. Trench Rock Removal: By the cubic yard measured before disintegration. Includes preparation of rock for removal, explosive disintegration of rock, removal from position, loading and removing from site. For over excavation, payment will not be made for over excavated work nor for replacement materials.

1.04 DEFINITIONS

- A. Site Rock: Solid mineral material with a volume in excess of 1/3 cubic yard or solid material that cannot be removed with a 3/4 cubic yard capacity power shovel without drilling.
- B. Trench Rock: Solid mineral material with a volume in excess of 2 cubic yards or solid material that cannot be removed with an excavator without drilling or blasting within a utility trench. Rock removeable by ripping shall not be designated as trench rock.
- C. Rock: Solid mineral material of a size that cannot be removed with a 2 cubic yard capacity power shovel.

1.05 REFERENCE STANDARDS

- A. NFPA 495 - Explosive Materials Code; 2018.

1.06 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate the proposed method of blasting, delay pattern, explosive types, type of blasting mat or cover, and intended rock removal method.

1.07 QUALITY ASSURANCE

- A. Seismic Survey Firm: Company specializing in seismic surveys with five years documented experience.
- B. Explosives Firm: Company specializing in explosives for disintegration of rock, with five years documented experience.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Explosives: Type recommended by explosive firm following seismic survey and required by authorities having jurisdiction.
- B. Delay Device: Type recommended by explosives firm.
- C. Blast Mat Materials: Type recommended by explosives firm.
- D. Mechanical Disintegration Compound: Grout mix of cementitious materials that expand on curing.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify site conditions and note subsurface irregularities affecting work of this section.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.

3.03 ROCK REMOVAL

- A. Excavate and remove rock by mechanical methods only; use of explosives is prohibited.
- B. Excavate and remove rock by either mechanical or explosive methods.
- C. Mechanical Methods: Drill holes and utilize expansive tools to fracture rock.
- D. If rock is uncovered requiring the explosives method for rock disintegration, notify the Architect.
- E. If rock is uncovered requiring the explosives method for rock disintegration, execute as follows:
 - 1. Provide seismographic monitoring during progress of blasting operations.
 - 2. Drill blasting holes within 12 feet of finished slope.
 - 3. Disintegrate rock and remove from excavation.
- F. Use of Explosives: Obtain permits from authorities having jurisdiction before explosives are brought to site or drilling is started.
 - 1. Comply with NFPA 495 and applicable state and local codes.
 - 2. Prior to blasting, obtain a seismographic survey to determine maximum charges that can be used at each location in area of excavation without damaging adjacent properties or other work.
 - 3. Prior to executing seismographic survey, advise owners of adjacent buildings and structures in writing; explain planned survey and blasting operations.
 - 4. Prior to blasting, document conditions of buildings near locations of intended blasting and photograph existing conditions identifying existing irregularities.
 - 5. Schedule work to avoid working hours of occupied buildings nearby.
- G. Form level bearing at bottom of excavations.
- H. Remove shale layers to provide sound and unshattered base for footings.
- I. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.
- J. Remove excavated materials from site.

- K. Correct unauthorized rock removal in accordance with backfilling and compacting requirements of Section 312323.
- L. Correct unauthorized rock removal to directions of Architect.

3.04 FIELD QUALITY CONTROL

- A. Independent agency field inspection will be provided under provisions of Section 014000 - Quality Requirements.
- B. Provide for visual inspection of foundation bearing surfaces and cavities formed by removed rock.

END OF DOCUMENT 312316.26

SECTION 312323 – FILL

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Filling, backfilling, and compacting for building volume below grade, footings, pile caps, slabs-on-grade, paving, site structures, and utilities within the building.
- B. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.
- C. Construct embankments with excavated subsoil and borrow.
- D. Prepare subsoil and borrow to receive subbase and base gravels and topsoil materials.
- E. Preparation of foundation bearing surfaces.
- F. Place, grade, and compact subbase and base gravels to receive pavement.
- G. Compaction requirements.
- H. Dust control.

1.02 RELATED REQUIREMENTS

- A. Section 312200 - Grading: Site grading.
- B. Section 312316 - Excavation: Removal and handling of soil to be re-used.
- C. Section 312316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.
- D. Section 312316.26 - Rock Removal: Removal of rock during excavating.

1.03 REFERENCE STANDARDS

- A. State of Maine Department of Transportation Standard Specifications, Latest Edition.
- B. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; 2010.
- C. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.
- D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012.
- E. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.
- F. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012.
- G. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.
- H. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
- I. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.
- J. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

- K. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2010.

1.04 SUBMITTALS

- A. Submittals shall be provided by the contractor at least 2 weeks in advance of imported fill use.
- B. Soil Samples: 10 pounds sample of each type of fill; submit in air-tight containers to testing laboratory.
- C. Materials Sources: Submit name of imported materials source.
- Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used. The results from the following tests shall be submitted:
1. Moisture and density relationship: ASTM D 1557 or D 698 as required by the Geotechnical Engineering Study (soils report).
 2. Mechanical Analysis AASHTO T-88.
 3. Mechanical Analysis AASHTO T-88.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where indicated.
1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 2. Prevent contamination
 3. Protect stockpiles from erosion and deterioration of materials.
 4. Prevent contact with in situ soils during storage.

PART 2 – PRODUCTS

2.01 FILL MATERIALS

- A. Subsoil: Reused meeting the requirements of Common Borrow.
- B. Common Borrow: MDOT 703.18; Earth suitable for embankment construction, free from frozen material, perishable rubbish, peat, organics and other unsuitable material, with sufficient moisture content to provide the required compaction and stable embankment, moisture content shall not exceed 4 percent above optimum. Determine optimum moisture content in accordance with ASTM D698 (cohesive soils) or D1557 (granular soils).
- C. Granular Borrow: MDOT 703.19; Mixture of sand, gravel, and silt or reclaimed asphalt, concrete, brick, crushed rock that is crushed and blended with sand, free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of that portion passing a 3 inch sieve shall meet the following requirements:
1. No. 40 sieve: 0 to 70 percent passing by weight.
 2. No. 200 sieve: 0 to 20 percent passing by weight.
 3. Granular borrow shall contain no particles or fragments with a maximum dimension in excess of one-half of the compacted thickness of the layer being placed. Granular Borrow shall not contain particles of rock which will not pass the 6 inch square mesh sieve.
- D. Aggregate Base: MDOT 703.06 Type 'A' crushed gravel, of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of that part that passes a 3 inch sieve shall meet the following requirements:
1. 1/2 inch sieve: 45 to 70 percent passing by weight
 2. 1/4 inch sieve: 30 to 55 percent passing by weight
 3. No. 40 sieve: 0 to 20 percent passing by weight

4. No. 200 sieve: 0 to 5 percent passing by weight
 5. Type A aggregate shall not contain particles of rock which will not pass the 2" square mesh sieve.
- F. Aggregate Subbase: MDOT 703.06 Type 'D' gravel, of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of that part that passes a 3 inch sieve shall meet the following requirements:
1. 1/4 inch sieve: 25 to 70 percent passing by weight
 2. No. 40 sieve: 0 to 30 percent passing by weight
 3. No. 200 sieve: 0 to 7 percent passing by weight
 4. Type D aggregate shall not contain particles of rock which will not pass the 6" square mesh sieve.
- G. Select/Structural Fill: MDOT 703.06 Type 'C' gravel modified to 4" maximum aggregate. Screened or crushed gravel of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of that part that passes a 4" sieve shall meet the following requirements:
1. 4 inch sieve: 100 percent passing by weight
 2. 3 inch sieve: 90 to 100 percent passing by weight
 3. 1/4 inch sieve: 25 to 90 percent passing by weight
 4. No. 40 sieve: 0 to 30 percent passing by weight
 5. No. 200 sieve: 0 to 5 percent passing by weight
- H. Crushed Stone: MDOT 703.22 Underdrain Backfill Type 'C' meeting the following requirements:
1. 1 inch sieve: 100 percent passing by weight
 2. 3/4 inch sieve: 90 to 100 percent passing by weight
 3. 3/8 inch sieve: 0 to 75 percent passing by weight
 4. No. 4 sieve: 0 to 25 percent passing by weight
 5. No. 10 sieve: 0 to 5 percent passing by weight
- I. Type 'B' Underdrain Sand: MDOT 703.22 Granular material meeting the requirements of MDOT 703.22 Type 'B' underdrain backfill, with the following limits:
1. 1 inch sieve: 90 to 100 percent passing by weight
 2. 1/2 inch sieve: 75 to 100 percent passing by weight
 3. No. 4 sieve: 50 to 100 percent passing by weight
 4. No. 20 sieve: 15 to 80 percent passing by weight
 5. No. 50 sieve: 0 to 15 percent passing by weight
 6. No. 200 sieve: 0 to 5 percent passing by weight
 7. Type B backfill shall not contain organic matter and shall not contain particles of rock which will not pass the 1-1/2 inch square mesh sieve.
- J. Topsoil: Either stripped from site or imported, friable loam: free of subsoil, large clods, lumps, roots, grass, excessive amounts of weeds, stone and foreign matter 2" or greater and smaller stones in excessive quantities as determined by the Owner: acidity range (pH) of 5.5 to 7.5: containing a minimum of 4 percent and a maximum of 25 percent organic matter.

2.02 ACCESSORIES

- A. Geotextile Fabric: Non-woven, Mirafi 140N, or approved equivalent.
- B. Water for sprinkling: Fresh and free from oil, acid, and injurious alkali or vegetable matter.
- C. Calcium chloride: ASTM D98 commercial grade except as waived by Owner.

2.03 SOURCE QUALITY CONTROL

- A. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
- B. If tests indicate materials do not meet specified requirements, change material and retest at no cost to owner.
- C. Provide materials of each type from same source throughout the Work.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that survey bench marks and intended elevations for the Work are as indicated.
- B. Identify required lines, levels, contours, and datum locations.
- C. See Section 312200 for additional requirements.
- D. Examine the areas and conditions under which excavating and filling is to be performed and notify owner in writing of conditions detrimental to proper and timely completion of work.
- E. Correct unsatisfactory conditions in a manner acceptable to owner prior to proceeding with work.
- F. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.
- G. Verify structural ability of unsupported walls to support imposed loads by the fill.
- H. Verify underground tanks are anchored to their own foundations to avoid flotation after backfilling.
- I. Verify areas to be filled are not compromised with surface or ground water.
- J. Comply with the requirements contained within this specification section, the contract drawings, and the recommendations contained within the Geotechnical Engineering Study (soils report). In the event of conflicting requirements, the more stringent standard shall apply

3.02 PREPARATION

- A. Proofroll subgrade surface to identify soft spots.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with select fill above the groundwater table or crushed stone below the groundwater table.
- C. Identify known underground utilities. Stake and flag locations. Locate and protect utilities to remain.
- D. Identify and flag surface and aerial utilities.
- E. Notify utility companies of work to be done.
- F. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- G. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FOUNDATION PREPARATION

- A. Construct building pad in such a manner as to provide positive drainage of surface water off the pad and to protect the pad surface and subgrade. Temporary ditches shall be constructed to carry any surface runoff away from the pad area, as directed by the Owner. At the start of building construction, the pad shall be prepared for foundations, and temporary ditches shall be properly backfilled.

- B. Topsoil and pavement shall be removed from the proposed building area. The exposed substrate shall be proofrolled with a 10-ton vibratory roller-compactor. Any areas that yield after 3 to 5 passes of the compaction equipment shall be over-excavated and replaced with compacted granular borrow in dry, non-freezing conditions and select fill in other conditions.
- C. Existing fill soils within the building footprint shall be removed beneath footings.
- D. Borrow for use beneath the building shall meet the requirements of granular fill.
- E. Should foundation subgrades become loose, soft, or difficult to work, the unsuitable soils shall be removed and replaced with additional granular borrow if above the groundwater table in the event of dry, non-freezing conditions; select fill in other conditions; or crushed stone underlain by geotechnical fabric if below the groundwater table.
- F. Excavations below foundations to provide the 6" working mat and/or to remove unsuitable soils shall continue laterally from the footing edges, a distance equal to the depth of the excavation below the bottom of the footing (1H/1V).
- G. All footings shall be underlain by a 6 inch (min) thick mat of select fill.
- H. All slab-on-grades shall be underlain by 9 inches (min) of compacted (Type "A") crushed gravel aggregate base.
- I. Soil fill placed adjacent to foundations exposed to freezing temperatures and as backfill around features such as bollards and light pole bases shall be select fill.
- J. Soil fill placed adjacent to foundations not exposed to freezing temperatures shall be granular fill.
- K. Place all fill in horizontal lifts and compact such that the desired density is achieved throughout the lift thickness with 3 to 5 passes of the compaction equipment. Loose lift thickness for soil fills shall not exceed 12 inches.
- L. Sub-slab fill shall be compacted to at least 95 percent of its maximum dry density as determined by ASTM D-1557.
- M. Exterior foundation backfill shall be compacted to at least 95 percent of its maximum dry density as determined by ASTM D-1557 beneath paved areas entrance slabs and adjacent to sidewalk areas. All other areas shall be compacted to at least 90 percent of its maximum dry density as determined by ASTM D-1557.
- N. Backfill for foundation walls acting as retaining walls shall be compacted to between 90 to 95 percent of ASTM D-1557 to avoid additional lateral stress on the walls associated with over-excavation.
- O. Crushed stone shall be compacted to 100 percent of its dry rodded unit weight as determined by ASTM C-29
- P. An exterior perimeter foundation drainage system using rigid 4" diameter perforated SDR-35 pipe shall be provided with 6 inches of crushed stone wrapped in geotextile fabric. Set the foundation drain adjacent to the footing, above the 6 inch working mat.
- Q. Exterior foundation backfill shall be sealed with a surficial layer of clayey or loamy soil in areas that are not paved or occupied by entrance slabs.

3.04 FILLING

- A. Fill to contours and elevations indicated using unfrozen materials.
- B. Topsoil and pavement shall be removed from proposed fill and pavement areas.
- C. Proofroll subgrade using a 10 ton vibratory roller-compactor unless otherwise noted. any areas that continue to yield after 3 to 5 passes of the compaction equipment shall be over excavated

and replaced with clean granular fill in dry non-freezing conditions and select fill in other conditions.

- D. Pavement subgrade shall consist of granular fill compacted to at least 95 percent of its maximum dry density as determined by ASTM D-1557.
- E. Landscape and playfield subgrade shall consist of common fill compacted to at least 90 percent of its maximum dry density as determined by ASTM D-1557.
- F. Place and compact fill materials in continuous layers not exceeding 12 inches loose depth upon compacted material.
- G. Fill up to subgrade elevations unless otherwise indicated.
- H. Employ a placement method that does not disturb or damage other work.
- I. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- J. Maintain optimum moisture content of fill materials to attain required compaction density.
- K. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- L. Correct areas that are over-excavated.
 - 1. Pavement areas: Use granular fill above the groundwater table in the event of dry non-freezing conditions, select fill in other conditions, and crushed stone below the groundwater table. Fill flush to required elevation, compacted to 95 percent of maximum dry density.
 - 2. Other areas: Use granular fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density. Use select fill or crushed stone as necessary to backfill wet areas of over excavation.
- M. Compaction Density Unless Otherwise Specified or Indicated:
 - 1. Under paving, slabs-on-grade, and similar construction: 95 percent of maximum dry density.
 - 2. At other locations: 90 percent of maximum dry density.
- N. Reshape and re-compact fills subjected to vehicular traffic.
- O. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Engineer. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.
- P. Leave stockpile areas completely free of excess fill materials.
- Q. Frost:
 - 1. Do not excavate to full indicated depth when freezing temperatures may be expected unless fill material or structures can be constructed immediately after the excavation has been completed. Protect the excavation from frost if placing of fill or structure is delayed.
 - 2. Fill shall not be placed over frozen soil. Soil that is frozen shall be removed prior to placement of compacted fill. Remove all frozen uncompacted soil prior to placing additional fill for compaction.
- R. Native soils can undergo substantial strength loss when subjected to construction traffic and excavation activities, particularly during periods of precipitation and shallow groundwater levels. Care must be exercised to minimize disturbance of the bearing soils. Should the subgrade become yielding or difficult to work, disturbed areas shall be excavated and backfilled in accordance with Section 3.04 L.

- S. Clean granular soil meeting the select fill gradation shall be provided to a depth of 4.0 feet below the top of entrance slabs and sidewalks in contact with the structure. The thickness of select fill shall extend horizontally from the structure outward to a point at least one foot beyond the width of the slab or sidewalk. The select fill shall have a gradual transition up to the bottom of the adjacent subbase at a 1V to 3H slope or flatter.

3.05 CONSTRUCTION OF AGGREGATE BASE AND SUBBASE COURSE

- A. Place and compact aggregate base and subbase course materials in continuous layers not exceeding 12 inches loose depth upon compacted material, unless noted otherwise.
- B. Employ a placement method so not to disturb or damage structures and utilities.
- C. Spread well mixed materials having no pockets of either fine or coarse material.
- D. Do not segregate large or fine particles.
- E. Compact by mechanical means to obtain 95 percent of maximum dry density as determined in accordance with ASTM D-1557. Base course material shall be compacted with a minimum of two passes with self-propelled vibratory compaction equipment.
- F. Maintain surface, compaction and stability until pavement course has been placed.
- G. Conform to elevations, contours, dimensions, line and grade shown on the Drawings.

3.06 FILL AT SPECIFIC LOCATIONS

- A. Refer to the Geotechnical Report for fill depths under the pool.

3.07 DUST CONTROL

- A. Upon request of Owner, implement the following dust control measures:
 - 1. Apply water and calcium chloride as directed by Owner.
 - 2. Spread calcium chloride uniformly over designated area.
 - 3. Apply water with equipment having a tank with pressure pump and nozzle equipped spray bar acceptable to Owner.

3.08 TOLERANCES

- A. Top surface of base and subbase course: Plus or minus 3/8 inch.

3.09 FIELD QUALITY CONTROL

- A. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.
- B. Compaction density testing will be performed by the Owner on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.
- C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Owner.
- E. Frequency of Tests:
 - 1. Building subgrade areas, including 10 feet outside exterior building lines: In fill areas, not less than one compaction test on each lift for every 2,500 square feet. Proofroll cut areas.
 - 2. Areas of construction exclusive of building subgrade: In fill areas, not less than one compaction test on each lift for every 10,000 square feet. Proofroll cut areas.

3.10 CLEANING

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

- B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF DOCUMENT 312323

SECTION 31 25 00 - SLOPE PROTECTION AND EROSION CONTROL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
- C. Restoration of areas eroded due to insufficient preventive measures.
- D. Performance bond.
- E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.02 RELATED SECTIONS

- A. Section 31 10 00 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.
- B. Section 31 22 00 - Grading: Temporary and permanent grade changes for erosion control.

1.03 REFERENCES

- A. ASTM D 4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc Type Apparatus; 2005.
- B. ASTM D 4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a (Reapproved 2004).
- C. ASTM D 4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2004.
- D. ASTM D 4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 1991 (Reapproved 2003).
- E. ASTM D 4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2004.
- F. ASTM D 4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2002.
- G. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; current edition; <http://cfpub.epa.gov/npdes/stormwater/cgp.cfm>.
- H. FHWA FLP-94-005 - Best Management Practices for Erosion and Sediment Control; Federal Highway Administration; 1995.
- I. USDA TR-55 - Urban Hydrology for Small Watersheds; USDA Natural Resources Conservation Service; 1986.
- J. State of Maine Department of Transportation "Standard Specifications" Latest Revision.

1.04 PERFORMANCE REQUIREMENTS

- A. Comply with all requirements of U.S. Environmental Protection Agency for erosion and sedimentation control, as specified for the National Pollutant Discharge Elimination System (NPDES), Phases I and II, under requirements for the 2003 Construction General Permit (CGP).
- B. Also comply with all more stringent requirements of State of Maine Erosion and Sediment Control Best Management Practices.

- C. Conform to Maine Department of Environmental Protection publication "Maine Erosion and Sediment Control Practices Field Guide For Contractors"
- D. Maintain erosion control installations in a functional condition at all times. Inspect after each rainfall and at least daily during prolonged rainfall. Immediately correct deficiencies.
- E. It shall be the Contractors responsibility to review and comply with the erosion and sediment control drawings that have been included in the site construction drawings, prepared by the engineer.
- F. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.
- G. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
- H. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- I. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
 - 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
 - 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 10 years.
- J. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
 - 1. Control movement of sediment and soil from temporary stockpiles of soil.
 - 2. Prevent development of ruts due to equipment and vehicular traffic.
 - 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- K. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
 - 1. Prevent windblown soil from leaving the project site.
 - 2. Prevent tracking of mud onto public roads outside site.
 - 3. Prevent mud and sediment from flowing onto sidewalks and pavements.
 - 4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- L. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
 - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
 - 2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
- M. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.

1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
- O. Open Water: Prevent standing water that could become stagnant.
- P. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.05 SUBMITTALS

- A. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Contractor Shall Provide all materials necessary to perform the work. Including but not limited to:
- B. Silt Fence: MDOT Section 656
- C. Erosion Control Mesh: MDOT Section 717.06
- D. Hay Bales: Baled Hay approximately 14"x18"x30" securely tied to form a firm bale.
- E. Stone Check Dams: 2" to 3" crushed stone
- F. Filter Fabric-Woven: Mirafi 600x or approved equal.
- G. Filter Fabric-Non-Woven: Mirafi 140N or approved equal.
- H. Stone for Stabilized Construction Entrance: Crushed Stone meeting the following requirements:
 1. 3 inch sieve: 100 percent passing by weight
 2. 2 inch sieve: 0 to 20 percent passing by weight.
 3. 3/4 inch sieve: 0 to 5 percent passing by weight.
- I. Erosion Control Mix: Erosion Control Mix meeting the following requirements:
 1. Organic matter content is between 80 and 100 percent, dry weight basis.
 2. Particle size by weight is 100 percent passing a 6" screen and a minimum of 70 percent, maximum of 85 percent, passing a 3/4" screen.
 3. The organic matter shall be fibrous and elongated.
 4. Large portions of silts, clays, or fine sands are not acceptable in the mix.
 5. Soluble salts content is less than 4.0 mmhos/cm.
 6. The pH shall fall between 5.0 and 8.0.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.
- B. Construction Entrances: Traffic-bearing aggregate surface.
 - 1. Width: As required; 25 feet, minimum.
 - 2. Length: 50 feet, minimum.
 - 3. Provide at each construction entrance from public right-of-way.
 - 4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.
- C. Linear Sediment Barriers: Made of silt fence or erosion control mix.
 - 1. Provide linear sediment barriers:
 - a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
- D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
 - 1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
- E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.
- F. Soil Stockpiles: Protect using one of the following measures:
 - 1. Cover with polyethylene film, or similar tarp, secured by placing soil on outer edges.
 - 2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, erosion control mix, shredded leaves, or 6 inches of straw or hay.
- G. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
- H. Temporary Seeding: Use where temporary vegetated cover is required.

3.04 MAINTENANCE

- A. Maintain erosion control installations in a functional condition at all times. Inspect preventive measures weekly, within 24 hours before and after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Clean out temporary sediment control structures as noted in the Erosion and Sedimentation Control Report for this project and relocate soil on site.
- D. Place sediment in appropriate locations on site; do not remove from site.

3.05 CLEAN UP

- A. Remove and properly dispose temporary measures after permanent measures have been installed.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.
- D. Clean sediment from catch basin sumps within the project work limits.

END OF DOCUMENT 31 25 00

SECTION 31 37 00 – RIPRAP

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Riprap for site work.

1.02 RELATED REQUIREMENTS

- A. Section 31 23 23 - Fill: Aggregate requirements.

1.03 QUALITY ASSURANCE

- A. Perform Work in accordance with State of Maine Department of Transportation Standard Specifications, latest edition. (MaineDOT Specifications).

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Plain Riprap: See MaineDOT Specifications Section 703.26-Plain Riprap.
- B. See Section 31 23 23 Fill for fabric requirements.

PART 3 – EXECUTION

3.01 PLACEMENT

- A. Place geotextile fabric over substrate, lap edges and key in ends.
- B. Comply with MaineDOT Specification Section 610 and as indicated on Drawings.

END OF DOCUMENT 31 37 00

SECTION 32 12 16 - ASPHALT PAVING

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Hot bituminous concrete paving.
- B. Single course bituminous concrete paving.

1.02 RELATED REQUIREMENTS

- A. Section 31 22 00 - Grading: Preparation of site for paving and base.
- B. Section 31 23 23 - Fill: Compacted subgrade for paving.
- C. Section 31 23 16.13 - Trenching for Site Utilities

1.03 REFERENCE STANDARDS

- A. State of Maine Department of Transportation Standard Specifications, Latest revision (for Hot Mix Asphalt (HMA) pavement designations), hereafter designated as MDOT Specifications.
- B. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction; 2009a.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with MaineDOT Section 403.
- B. Mixing Plant: Complying with Maine Department of Transportation standard.
- C. Obtain materials from same source throughout.

1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable code for paving work on public property.
- B. Temporary trench patch asphalt (Hot Mix Asphalt – 12.5 mm) shall be placed in all street trenches if the Contractor is not going to be actively working in that area of the site for more than 16 hours (for example – over a weekend).
- C. All temporary pavements shall be removed and replaced with final pavement that is placed in accordance with the specifications.

1.06 FIELD CONDITIONS

- A. Weather and seasonal limitations as required by MaineDOT Section 401.07 shall apply to this Section.
- B. Temporary trench patch asphalt may be required in the areas specified if the weather conditions do not meet MaineDOT specifications for placing pavement and it is near the end of the regular paving season.

1.07 TESTS

- A. Submit proposed mix design of each class of mix for review prior to commencement of work.
 - 1. Mix design must be for current year.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. MaineDOT - 403.208 Hot Mix Asphalt – 12.5 mm Base
- B. MaineDOT – 403.207 Hot Mix Asphalt – 19 mm Base
- C. MaineDOT – 403.210 Hot Mix Asphalt – 9.5 mm Surface

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.
- C. Beginning of installation means acceptance of substrate.

3.02 PREPARATION AND PLACEMENT

- A. Tack coat shall be applied to any existing pavement at a rate of approximately 0.03 gal/sq yd, and on milled pavement approximately 0.06 gal/sq yd, prior to placing new course. All joints between existing and new pavement shall be tacked.
- B. Prepare and place plant mix hot bituminous pavement in accordance with MaineDOT Sections 401 and 403.
 - 1. Compaction of the new Hot Mix Asphalt Pavement will be obtained using a minimal roller train consisting of a 3-5 ton vibratory roller.
 - 2. An approved release agent is required to ensure the mixture does not adhere to hand tools, rollers, pavers and truck bodies. The use of petroleum base fuel oils will not be permitted.
 - 3. The Owner will pay for the work specified in subsection 401.11 for the HMA used, except that cleaning objectionable material from the pavement and furnishing and applying item 409.15 bituminous material to joints and contact surfaces is incidental.

3.03 PREPARATION - TACK COAT

- A. Apply tack coat in accordance with manufacturer's instructions. The application of the bituminous tack coat shall be incidental to the application of Hot Mix Asphalt Pavement and shall require no measurement or payment.

3.04 PLACING ASPHALT PAVEMENT

- A. Install pavement in accordance with MaineDOT Specifications.
- B. Place asphalt within 24 hours of applying primer or tack coat.
- C. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.
- D. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.05 TOLERANCES

- A. Flatness: Conform to requirements of MaineDOT Section 401.20
- B. Compacted Thickness: Conform to requirements of MaineDOT Section 401.17.
- C. Variation from True Elevation: Conform to requirements of MaineDOT Section 403.

3.06 FIELD QUALITY CONTROL

- A. Owner shall provide field inspection and testing. Owner shall take samples and perform tests in accordance with MaineDOT Specifications.
- B. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to the Owner

3.07 PROTECTION

- A. Immediately after placement, protect pavement from mechanical injury for 5 days

3.08 ATTACHMENTS

- A. Special Provision Section 403 - Hot Mix Asphalt

END OF DOCUMENT 32 12 16

SECTION 32 16 00 – CURBS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Slipform concrete curb as specified in MaineDOT Special Provision Section 609 – Curb (attached).
- B. Delete Section 609.04 and 609.05 in attached MaineDOT Special Provision Section 609 – Curb.

1.02 RELATED SECTIONS

- A. Division 32 Section "Asphalt Paving".
- B. Construction Drawings.

1.03 REFERENCES

- A. State of Maine Department of Transportation Standard Specifications, latest edition (MaineDOT Specifications).

1.04 DEFINITIONS

- A. See attached MaineDOT Special Provision Section 609 - Curb

1.05 SUBMITTALS

- A. Product Data: Provide drawings showing dimensions of slipform curb mold 2 as shown on construction drawings.
- B. Certificates: Certify that products of this section meet or exceed specifications of MaineDOT Special Provision Section 609 – Curb (attached).

1.06 QUALITY ASSURANCE

- A. Perform in accordance with MaineDOT Specifications and as indicated on Plans.
 - 1. Maintain one copy of MaineDOT Specifications on project site.

PART 2 – PRODUCTS

2.01 SLIPFORM CONCRETE CURB

- A. MANUFACTURERS
 - 1. See MaineDOT Special Provision Section 609 - Curb

2.02 MATERIALS

- A. Comply with requirements in MaineDOT Specifications Section 609.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify gradients and elevations of base are correct.

3.02 PREPARATION

- A. Coordinate with Paving and Landscaping.

3.03 INSTALLATION

- A. Install in accordance with MaineDOT Special Provision Section 609 (attached) and as indicated on plans.
- B. Type 5 Curb - Install in accordance with MaineDOT Specifications Section 609.06 and as indicated on plans.
- C. Removing and Stacking Vertical Curbing, Terminal Curbing, Transition Sections, Curb Inlets, and Curb Corners (Type 1): The Contractor shall be responsible for the removal without damage, cleaning and stacking at a City designated location, all straight and curved curbing, terminal sections, and curb corners which are designated to be replaced with new curb and shall be incidental to Item 609 items. Removal of curbing so designated shall be in accordance with the requirements of Subsection 609.08. Removing and stacking curb or edging shall include all labor, equipment, tools and materials for excavating, removing, cleaning, backfilling, handling, stacking and any incidental work necessary.

3.04 ERECTION TOLERANCES

- A. Type 1 and Type 5 Curb - See MaineDOT Specifications Section 609.03.

3.04 ATTACHMENT

- A. MaineDOT Special Provision Section 609 - Curb

END OF DOCUMENT 32 16 00

SPECIAL PROVISION
SECTION 609 – CURB
STRUCTURAL CONCRETE
(Slipform Concrete Curb)

609.01-Description This work shall consist of furnishing and placing Slipform Concrete Curb in close conformity with the plans, or as authorized by the Resident.

609.02 Materials Except as provided below, the materials used shall meet the requirements specified in Section 700 – Materials:

Portland Cement and Portland Pozzolan Cement	701.01
Water	701.02
Fine Aggregate for Concrete	703.01
Coarse Aggregate for Concrete	703.02
Air Entraining Admixtures	703.03

The aggregate shall conform to the requirements of Subsections 703.01 and 703.02.

A mix design for the Portland Cement Concrete shall be submitted to the Resident meeting the requirements of Class A or Class LP with the exception that permeability requirements shall be waived.

Entrained air content of Slipform curbing shall be 4.0% to 7.0%.

Partially discharged loads may be retempered with water provided the maximum water to cement ratio is not exceeded.

Maximum concrete temperature at placement shall be 90 F.

Proposed mix designs may contain polypropylene fibers.

609.03-General

a. Preparation of Base Before placing the curb, the foundation course shall be thoroughly cleaned of all foreign and objectionable material. The Contractor shall not place Slipform Concrete Curb on a wet or frozen base. Base pavement for placing epoxy resin binder and slipform curbing may be in an SSD condition but no standing water shall be allowed. String or chalk lines shall be positioned on the prepared base to provide guide lines. For HMA or PCC base the foundation shall be uniformly painted with an epoxy resin adhesive that meets AASHTO M 235, Type I, II, III, IV, or V. Proposed Epoxy Resin Adhesive from the Departments QPL shall be submitted with the concrete mix design for approval prior to placement and used in accordance with manufacturers recommendations.

b. Placing Concrete shall be placed with an approved Slipform machine that will produce a finished product according to the design specified in the plans. For cold weather Slipforming, the outside temperature must be at least 36°F (2.2°C) and rising. The curb shall be placed on a firm, uniform bearing surface, shall conform to the section profile specified in the plans, and shall match the appropriate grade. Expansion joints will be provided at ends of curve radii, or wherever the curb meets rigid structures such as building foundations or fire hydrants. Contraction joints will be placed at 10 foot (3 m) intervals using sawing methods, which shall cut 1-3" into the concrete. Joints shall be constructed perpendicular to the subgrade and match other joints in roadways, sidewalks or other structures when applicable.

c. Curing and Sealing Proper curing shall be insured through the use of either a combination curing/sealing compound spray that meets ASTM 1315 Type 1-Class A, or a curing compound spray that meets ASTM 309 type 1-D – Class A. Curing may also be accomplished by the methods specified in Section 502.15 of the Specifications.

If a combination curing/sealing compound spray is not used, a separate sealing compound from the MaineDOT Qualified Products List for a Type 2 sealer shall be applied after the concrete has cured.

d. Protection Slipform curb must be adequately protected after placement. The concrete shall be allowed to cure for at least 72 hours. During cold weather conditions, when temperatures drop below the required temperature of 36°F (2.2°C) after placement, curbing shall be protected by concrete blankets or a combination of plastic sheeting and straw. After any placement of Slipform curb, regardless of weather conditions, the placed curb shall be adequately protected by traffic control devices as necessary.

e. Marking When required, the curb shall be painted and coated with glass beads in accordance with Section 627 - Pavement Marking. Curb designated to be painted shall not be sealed unless a combination curing/sealing compound is used.

f. Acceptance Curb shall be accepted or rejected based on finish, alignment, entrained air content, and compressive strength. Acceptance testing for air content and compressive strength will be under 502 Method C. All damaged curb shall be removed and replaced at the Contractor's expense.

609.04-Method of Measurement Concrete Slipform curb will be measured by the linear foot along the front face of the curb at the elevation of the finished pavement, complete in place and accepted.

609.05 Basis of Payment The accepted quantities of curb will be paid for at the contract unit price per linear foot as specified.

There will be no separate payment for concrete, sealing, incidental materials, or labor needed to install the curb, but these will be considered included in the work of the related curb.

Removal of existing curb and necessary excavation for installing curb will not be paid for directly, but shall be considered to be included in the curb pay item. Base and Subbase material will be paid for under Section 304 - Aggregate Base and Subbase Course. Backing up machine laid curb is incidental to the curb items. Loam, as directed, will be paid under 615 – Loam.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
609.21 Concrete slipform curb	Linear Foot
609.214 Concrete slipform curb – 4' terminal end	Each
609.218 Concrete slipform curb – 8' terminal end	Each

SECTION 32 17 23.13 - PAINTED PAVEMENT MARKINGS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. The extent of pavement marking is shown on the drawings.
- B. Work includes, but is not limited to, the following:
 - 1. Parking stall divider lines.
 - 2. Wheelchair legends.
 - 3. "Stop" legends.
 - 4. Diagonal striping.
 - 5. Crosswalks.

1.02 RELATED REQUIREMENTS

- A. Section 32 12 16 - Asphalt Paving.
- B. Section 32 13 13 - Concrete Paving.

1.03 REFERENCE STANDARDS

- A. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.
- B. State of Maine Department of Transportation Standard specifications Highways and Bridges, latest revision, hereafter designated as MaineDOT Specifications.
- C. ASTM D 93, D 562, D 711, D 821, D 1210, D 1475, D 1640, D 2243, D 2369, D 2486, D 3723, D 3960, E 70, and G 53.
- D. DOT Code of Federal Regulations, Hazardous Materials and regulations board, Reference 49CFR, ICC Regulations.
- E. Federal Specification TT-P-115E, Type III (Type I if V.O.C. compliance required), colors 33538 and 37038.
- F. FHWA MUTCD - Manual on Uniform Traffic Control Devices for Streets and Highways; U.S. Department of Transportation, Federal Highway Administration; Current Edition.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with MaineDOT Specifications 627.

1.05 SUBMITTALS

- A. Shop Drawings: Indicate sizes, shapes, patterns, colors of marking, manufacturers and types of paints.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
- D. Deliver all materials to the job site with all labels intact and legible at time of installation.
- E. Store materials off ground under cover. Protect from damage or deterioration.
- F. Handle materials so as to prevent damage to surface, edges, ends, and factory applied finishes of items. Damaged material shall be rejected and replaced.

1.07 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.08 GUARANTEE

- A. Contractor shall guarantee entire installation for one year from turnover date.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Subject to compliance with requirements, provide ready-mixed one component water borne traffic line paint. Materials shall be listed on the Department of General Services Office of Procurement Qualified Products List.
- B. Paints shall contain all necessary co-solvents, dispersants, wetting agents, preservatives, and all other additives, so that paint shall retain viscosity. Halogenated solvents and glass beads shall not be permitted.
- C. Volatile Organic Compound (VOC) content shall not exceed 250 grams maximum per liter of paint as determined in accordance with ASTM D 3960 test, excluding water and exempt solvents.
- D. Line and Zone Marking Paint: MPI No. 97 Latex Traffic Marking Paint; color(s) as indicated.
- E. Temporary Marking Tape: Preformed, reflective, pressure sensitive adhesive tape in color(s) required; Contractor is responsible for selection of material of sufficient durability as to perform satisfactorily during period for which its use is required.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Installer shall examine the substrates and conditions under which materials are to be installed, and notify the Owner in writing of conditions detrimental to the completion of the work. Do not proceed with the work until traffic lines are completed and properly dry.
- C. Coordinate provisions for installation with work of other trades.
- D. All parking area marking and painting to be protected by appropriate traffic barriers, lighted if necessary, so located as to prohibit parking and traffic until permission for such is given by the Owner.

3.02 PREPARATION

- A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- B. Clean surfaces thoroughly prior to installation.
 - 1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.
- C. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.

- D. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.
- E. Temporary Pavement Markings: When required or directed by Engineer, apply temporary markings of the color(s), width(s) and length(s) as indicated or directed.
 - 1. After temporary marking has served its purpose, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method so that surface to which the marking was applied will not be damaged.
 - 2. At Contractor's option, temporary marking tape may be used in lieu of temporary painted marking; remove unsatisfactory tape and replace with painted markings at no additional cost to Owner.

3.03 INSTALLATION

- A. Begin pavement marking as soon as practicable after surface has been cleaned and dried.
- B. Install pavement marking in accordance with approved shop drawings and applicable codes and standards.
- C. Traffic paint shall be installed in two coats. The first coat shall be installed at 1/2 the recommended coverage rate after paving is in place; the second coat shall be installed at full recommended rate 30 days later.
- D. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.
- E. Comply with FHWA MUTCD manual (<http://mutcd.fhwa.dot.gov>) for details not shown.
- F. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.
- G. Apply uniformly painted markings of color(s), lengths, and widths as indicated on drawings true, sharp edges and ends.
- H. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

3.04 COMPLETION

- A. During the progress of the work, the premises shall be kept free of debris and waste resulting from the work in this section. Upon completion, all surplus material and debris shall be removed from the site.
- B. At completion of work, touch up minor damage to prefinished surfaces to the satisfaction of the Owner. Replace materials damaged or stained during installation.

3.05 DRYING, PROTECTION, AND REPLACEMENT

- A. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.
- B. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings.
- C. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.
- D. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities.
- E. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other approved method.

- F. Replace removed markings at no additional cost to Owner.

END OF DOCUMENT 32 17 23.13

SECTION 33 01 10.58 - DISINFECTION OF WATER UTILITY PIPING SYSTEMS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Disinfection of site domestic water lines and site fire water lines specified in Section 33 14 16.
- B. Disinfection of water well.
- C. Testing and reporting results.

1.02 RELATED REQUIREMENTS

- A. Section 33 14 16 - Site Water Utility Distribution Piping.
- B. Section 33 11 13 - Potable Water Supply Wells.

1.03 REFERENCE STANDARDS

- A. AWWA B300 - Hypochlorites; 2011.
- B. AWWA B301 - Liquid Chlorine; 2010.
- C. AWWA B302 - Ammonium Sulfate; 2010.
- D. AWWA B303 - Sodium Chlorite; 2010.
- E. AWWA C651 - Disinfecting Water Mains; 2005.

1.04 SUBMITTALS

- A. Test Reports: Indicate results comparative to specified requirements.
- B. Certificate: Certify that cleanliness of water distribution system meets or exceeds specified requirements.
- C. Disinfection report:
 - 1. Type and form of disinfectant used.
 - 2. Date and time of disinfectant injection start and time of completion.
 - 3. Test locations.
 - 4. Initial and 24 hour disinfectant residuals (quantity in treated water) in ppm for each outlet tested.
 - 5. Date and time of flushing start and completion.
 - 6. Disinfectant residual after flushing in ppm for each outlet tested.
- D. Bacteriological report:
 - 1. Date issued, project name, and testing laboratory name, address, and telephone number.
 - 2. Time and date of water sample collection.
 - 3. Name of person collecting samples.
 - 4. Test locations.
 - 5. Initial and 24 hour disinfectant residuals in ppm for each outlet tested.
 - 6. Coliform bacteria test results for each outlet tested.
 - 7. Certification that water complies, or fails to comply, with bacterial standards of Portland Water District.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with AWWA C651 and State of Maine Drinking Water Program.

- B. Water Treatment Firm: Company specializing in disinfecting potable water systems specified in this Section with minimum three years documented experience.
- C. Testing Firm: Company specializing in testing potable water systems, certified by governing authorities of Maine.
- D. Submit bacteriologist's signature and authority associated with testing.

1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable code or regulation for performing the work of this Section.

PART 2 – PRODUCTS

2.01 DISINFECTION CHEMICALS

- A. Chemicals: AWWA B300, Hypochlorite, AWWA B301, Liquid Chlorine, AWWA B302, Ammonium Sulfate, and AWWA B303, Sodium Chlorite.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Verify that piping system and water well has been cleaned, inspected, and pressure tested.
- B. Schedule disinfecting activity to coordinate with start-up, testing, adjusting and balancing, demonstration procedures, including related systems.

3.02 DISINFECTION

- A. Use method prescribed by the applicable state or local codes, or health authority or water purveyor having jurisdiction, or in the absence of any of these follow AWWA C651.
- B. Provide and attach equipment required to perform the work.
- C. Inject treatment disinfectant into piping system.
- D. Maintain disinfectant in system for 24 hours.
- E. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water.
- F. Replace permanent system devices removed for disinfection.
- G. Pressure test system to 100 psi. Repair leaks and re-test.

3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 01 40 00.
- B. Test samples in accordance with AWWA C651.

END OF DOCUMENT 33 01 10.58

SECTION 33 05 13 - MANHOLES AND STRUCTURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Modular precast concrete manhole sections with tongue-and-groove joints with masonry transition to lid frame, covers, anchorage, and accessories.
- B. Modular precast catch basins with frames and grates.
- C. Accessories: tongue and groove joint sealant, manhole steps, sewer brick, pipe to manhole joints, water quality inlets.
- D. Precast concrete vault tank.

1.02 RELATED REQUIREMENTS

- A. Section 31 23 16 - Excavation.
- B. Section 31 23 16.13 - Trenching.
- C. Section 33 31 13 - Site Sanitary Utility Sewerage Gravity Piping.
- D. Section 33 42 11 – Stormwater Gravity Piping

1.03 REFERENCE STANDARDS

- A. ASTM C478 - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections; 2015.
- B. ASTM C478M - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections [Metric]; 2015.
- C. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals; 2008 (Reapproved 2013).
- D. ASTM C923M - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals [Metric]; 2008b (Reapproved 2013).

1.04 SUBMITTALS

- A. Shop Drawings: Indicate manhole locations, elevations, piping sizes and elevations of penetrations.
- B. Product Data: Provide manhole covers, component construction, catch basin frames and grates, pipe to manhole connectors, manhole steps, manhole joint sealant, features, configuration, precast concrete vault tank, and dimensions.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.06 REGULATORY REQUIREMENTS

- A. Perform work in accordance with the State of Maine DOT Standard Specifications.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Manhole and Catch Basin Sections: Reinforced precast concrete in accordance with ASTM C 478 (ASTM C 478M), with resilient connectors complying with ASTM C 923 (ASTM C 923M).
 - 1. Use concrete that will attain a 28-day compressive strength of not less than 4,000 psi.
 - 2. Reinforcing: H-20 loading.
 - 3. Horizontal Joints:
 - a. Tongue and Groove formed of concrete to receive a flexible plastic gasket.
 - b. Joints to be watertight.
 - c. Cast to allow installation to be vertical and in true alignment.
 - 4. Provide two tapered lifting holes 180 degrees apart in each section for handling and placing.
 - 5. Base section: Cast holes for pipes to provide invert elevations as required by drawings.
 - 6. Pipe to structure joints:
 - a. Flexible sleeves, rubber quality, ASTM C-443 and C-361 cast into base.
 - b. If pre-manufactured adaptor cannot be installed, use rubber concrete adaptor designed to provide a watertight seal between pipe and structure.
- B. Mortar and Grout:
 - 1. Masonry below grade and in contact with earth: Type S
- C. Concrete Masonry Units: ANSI/ASTM C-139
- D. Manhole Brick: ANSI/ASTM C 32, Grade MS.
- E. Sewer Brick: ANSI/ASTM C 32, Grade SS
- F. Masonry Mortar: ANSI/ASTM C 270, Type M.
- G. Manhole Frames and Covers: Grey cast iron ANSI/ASTM A 48, Class 30 B.
 - 1. Furnish covers with cast in legend on roadway face as indicated.
- H. Manhole Steps: Polypropylene steps meeting the requirements of ASTM C-478 and AASHTO M-199. Polypropylene conforms to ASTM-D4101. Grade 60, 1/2 inch diameter reinforcing bar meeting the requirements of ASTM A-615.
- I. Catch Basin Frames and Gratings: Grey cast iron, ANSI/ASTM A 48, Class 30 B.
- J. Other Precast Structures:
 - 1. Use concrete that will attain a 28-day compressive strength of not less than 5,000 psi.
 - 2. Manufactured in accordance with ASTM C-478.
 - 3. Reinforcing: H-20 loading.
 - 4. Horizontal Joints:
 - a. Tongue and Groove formed of concrete to receive a flexible plastic gasket.
 - b. Joints to be watertight.
 - c. Cast to allow installation to be vertical and in true alignment.
 - 5. Pipe to Structure Joints:
 - a. Flexible sleeves, rubber quality, ASTM C-433 and C-361 cast into base.
 - b. If pre-manufactured adaptor cannot be installed, use rubber-concrete adaptor designed to provide a watertight seal between pipe and structure.
 - 6. Vault toilet tank:
 - a. 1000 gallon lowboy privy tank or approved equivalent
 - b. Dimensions: 6'-4" wide by 10'5" long

c.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify items provided by other sections of Work are properly sized and located.
- B. Verify that built-in items are in proper location, and ready for roughing into Work.
- C. Verify excavation for manholes, catch basins and other structures is correct.

3.02 PREPARATION

- A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

3.03 PRECAST CONCRETE STRUCTURES

- A. Precast Concrete Structures: Place precast concrete sections as shown on drawings. Where structures occur in pavement, set tops of frames and covers flush with finish surface. Elsewhere set tops 3" above finish surface, unless otherwise indicated.
 - 1. Use epoxy bonding compound where manhole steps are mortared into structure walls.
 - 2. Provide rubber joint gasket complying with ASTM C-443.
 - 3. Place base section level on 12 inch layer of crushed stone.
 - 4. Fix inlet and outlet stubs into sleeves with stainless steel pipe clamp.
 - 5. Place barrel sections, cones or tops of the appropriate combination of heights to meet grades required by Drawings or existing conditions.
 - 6. Seal horizontal joints as recommended by manufacturer.
 - 7. Apply lubricant to inside tongue and rubber gaskets immediately prior to joining sections.
 - 8. Fill lifting holes with non-shrink mortar.
 - 9. Place frame and grate on top or otherwise prevent accidental entry by unauthorized persons until ready for adjustment to grade.
 - 10. Repair damaged coating of frames and covers with coal-tar-pitch varnish.

3.04 MASONRY WORK

- A. Laying Brick:
 - 1. Use clean bricks.
 - 2. Lay Brick by methods consistent with the trade acceptable to Owner.
 - 3. Lay in a full bed of mortar and joint without subsequent grouting, flushing, or filling, and thoroughly bond.
 - 4. Bring casting rim to grade with brick and coat outside with mortar; minimum thickness 3/8 inch with troweled waterproof surface.

3.05 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with the requirements of the servicing utility.
- B. Provide copies of test report to owner and servicing utility, documenting results and compliance with requirements in advance of requesting a certificate of occupancy.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

END OF DOCUMENT 33 05 13

SECTION 33 14 16 - SITE WATER UTILITY DISTRIBUTION PIPING

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Pipe and fittings for site water lines including domestic water lines.
- B. Valves.

1.02 RELATED REQUIREMENTS

- A. Section 31 23 16 - Excavation: Excavating of trenches.
- B. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.
- C. Section 31 23 23 - Fill: Bedding and backfilling.

1.03 REFERENCE STANDARDS

- A. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service; 2017.

1.04 SUBMITTALS

- A. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- C. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with utility company requirements. The Contractor shall comply with the requirements contained within this section and those contained within the Departments requirements. In the event of conflicting requirements, the more stringent standard shall apply.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Unload materials so as to avoid shock or damage. Handle and store all pipe in such a manner as to avoid deterioration or other injury thereto. Place no pipe within pipe of larger size. Store pipe and fittings on sills above storm drainage level and ready for delivery for laying after trenches are excavated. Valves and hydrants shall be drained and stored to protect them from damage.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. 1" Blue CTS Polyethylene Tubing: AWWA C901, Pressure rated at 200PSI.
- B. Ball Valves Up To 2 Inches: Brass body, Teflon coated brass ball, rubber seats and stem seals, Tee stem pre-drilled for control rod, AWWA inlet end, compression outlet with electrical ground connector, with control rod, valve key, and extension box.
- C. Other Water Service Brass (fittings, corporations, etc): AWWA C800.

2.02 BEDDING AND COVER MATERIALS

- A. Bedding: As specified in Section 31 23 16.13.
- B. Cover: As specified in Section 31 23 16.13.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that building service connection inverts are as indicated.

3.02 TRENCHING

- A. See the sections on excavation and fill for additional requirements.
- B. See Section 31 23 16.13 for additional requirements.
- C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.03 INSTALLATION - PIPE

- A. Service line from existing well shall be furnished and installed to serve the project.
- B. Pipe Laying - General:
 - 1. The interior of all pipe shall be clean and joint surfaces wiped clean and dry before the pipe is lowered into trench. Lower each pipe, fitting and valve into the trench carefully and lay true to line and without objectionable breaks in grade. The depth of cover below finished grade shall be not less than 5'-6" and the standard cover shall be 6'-0"
 - 2. Provide uniform bearing for all pipes in trenches. Do not allow trench water or dirt to enter the pipe after laying. Insert a watertight plug in the open end of the piping while laying of pipe is not in progress.
 - 3. Do not lay pipe closer than 10 feet to a sewer. At cross-overs with sewers, no joint in the water line shall be closer than 6 feet from the cross-over point. A minimum vertical distance of 18 inches between the outside of the water main and the outside of the sewer shall be maintained when the water main is either above or below the sewer. Provide valves, plugs or caps, as required, where pipe ends are left for future connections.
- C. All pipes shall be laid with standard provisions for expansion and contraction and in accordance with manufacturers recommendations. All pipe with slip type joints shall be restrained at elbows and tees by thrust blocks or rods and clamps.
- D. Install suitable fittings at all changes in direction, dead ends and branch connections, provided that double strap saddles, in lieu of tees, may be used for service taps
- E. Before setting each valve, make sure that the interior is clean, and test opening and closing. Set valves and stops with stems plumb and at the exact location shown. Provide brick laid flat, or other similar foot-pieces, under each curb box. Valve and service boxes shall be plumb, with tops at finished grade.
- F. Route pipe in straight line.
- G. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- H. Slope water pipe and position drains at low points.
- I. Connect to building water outlets.

3.04 INSTALLATION - VALVES

- A. Set valves on solid bearing.
- B. Center and plumb valve box over valve. Set box cover flush with finished grade.

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SECTION 331416
SITE WATER UTILITY
DISTRIBUTION PIPING

END OF DOCUMENT 33 14 16

SECTION 33 31 13 - SITE SANITARY SEWERAGE GRAVITY PIPING

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Sanitary sewerage drainage piping, fittings, and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 31 23 16 - Excavation: Excavating of trenches.
- B. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.
- C. Section 31 23 23 - Fill: Bedding and backfilling.
- D. Section 33 05 13 - Manholes and Structures.

1.03 REFERENCE STANDARDS

- A. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2015.
- B. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe; 2009 (Reapproved 2014).
- C. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015.
- D. ASTM D 2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
- E. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2014.
- F. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.
- G. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2015.
- H. ASTM F 1417 - Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.
- I. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2012.

1.04 SUBMITTALS

- A. Product Data: Provide data indicating pipe, pipe accessories .
- B. Gravity and force main sewer testing results.
- C. Project Record Documents:
 - 1. Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.
 - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.05 REGULATORY REQUIREMENTS

- A. Perform work in accordance with City of Portland Public Works Department Requirements.

PART 2 - PRODUCTS

2.01 SEWER PIPE MATERIALS

- A. Plastic Pipe: ASTM D3034, SDR 35, Type PSM, Poly(Vinyl Chloride) (PVC) material; inside nominal diameter of 6 inches, bell and spigot style solvent sealed joint end.
- B. Pipe shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM classification.
- C. Pipe joints shall be integrally molded bell ends in accordance with ASTM D 3034 Table 2, with factory supplied elastomeric gaskets and lubricant.
- D. Polyvinyl Chloride Pressure Sewer less than 4" diameter: ASTM 2241, Strength requirement SDR 21.
- E. Polyvinyl Chloride Pressure Sewer:
 - 1. Pipe and fittings shall comply with AWWA C-900-07 rated SDR 18 and shall be continually marked with manufacturers name, pipe size, cell classification, SDR rating and AWWA C-900-07 classification.
 - 2. Joints shall be integral gasketed joints formed on a continuous pipe length, utilizing elastomeric seal such as "Ring Tite" as manufactured by Johns Manville Company.
- F. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

2.02 BEDDING AND COVER MATERIALS

- A. Pipe Bedding Material: As specified in Section 31 23 16.13.
- B. Pipe Cover Material: As specified in Section 31 23 16.13.

PART 3 – EXECUTION

3.01 TRENCHING

- A. See Section 31 23 16.13 for additional requirements.
- B. Hand trim excavation for accurate placement of pipe to elevations indicated.
- C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.02 INSTALLATION - PIPE

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
- B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
 - 1. Plastic Pipe: Also comply with ASTM D2321.
- C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- D. Connect to building sanitary sewer outlet .
- E. Make all required connections to existing sewers. Carry out such work in accordance with local standards. Observe care to prevent debris from entering sewers. Check the invert elevations of existing sewers to which connections are to be made, and if appreciable difference from

elevations noted on the drawings, or if they involve any difficulty in obtaining necessary drainage, notify the Engineer immediately so that appropriate corrective action may be taken.

- F. Commence at the lowest point in the system and lay the pipe with the bell end up grade. Test pipe for soundness and clean interior and joint surfaces before lowering the pipe into the trench. Lay pipe in straight lines and on uniform grades between points where changes in alignment or grade are shown. Bed the pipe barrel uniformly.
- G. Comply fully with manufacturer's instructions for sewer pipe jointing, using sealing or lubricating compounds supplied by the manufacturer, and apply proper pressure to seal the spigot in the bell.
- H. As soon as the joint material has set, pack fine earth carefully around the joints, and around and over the pipe. Carry this backfill operation to a depth of at least twelve inches above the top of the pipe. Care shall be used in tamping backfill under lower parts of the pipe to give proper support, especially in shallow trenches.
- I. Flush all sanitary sewers, including building connections, with water in sufficient volume to obtain free flow through each line. Remove any obstructions and correct any defects discovered.

3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with the requirements of the servicing utility.
- B. Provide copies of test report to owner and servicing utility, documenting results and compliance with requirements in advance of requesting a certificate of occupancy.
- C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
- D. Pressure Test (Gravity Sewer): Test in accordance with ASTM F 1417.
- E. Pressure Test Force Main: Use Hydrostatic test as follows:
 - 1. Fill section of pipe with water and expel all air.
 - 2. Pressurize to 1.5 times the normal operating pressure but not less than 60 psi.
 - 3. Measure leakage over a 2-hour test period.
 - 4. Acceptable leakage: less than 10 gallons per day per inch diameter per mile of pipe tested.

3.04 TESTING OF SANITARY SEWER FORCE MAIN

- A. Leakage in pressure main shall not exceed 0.3 gallons per 1,000 feet-gph. The contractor shall furnish all necessary equipment and personnel for making such tests. Should the pipe fail to meet the leakage requirements, it shall be re-excavated and repaired by the Contractor at no cost to owner.

3.05 PROTECTION

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF DOCUMENT 33 31 13

SECTION 33 41 00 – SUBDRAINAGE

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Building Perimeter, Retaining Wall, and Under-Slab Drainage Systems.
- B. Filter aggregate and fabric and bedding.

1.02 RELATED REQUIREMENTS

- A. Section 31 23 16 - Excavation: Excavating for subdrainage system piping and surrounding filter aggregate.
- B. Section 31 23 23 - Fill: Backfilling over filter aggregate, up to subgrade elevation.

1.03 REFERENCE STANDARDS

- A. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.

1.04 SUBMITTALS

- A. Product Data: Provide data on pipe drainage products, pipe accessories, and fittings.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- C. Project Record Documents: Record location of pipe runs, connections, cleanouts and principal invert elevations.

1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable code for materials and installation of the work of this section.

PART 2 – PRODUCTS

2.01 PIPE MATERIALS

- A. Polyvinyl Chloride Pipe: ASTM D2729; plain end, 4 inch inside diameter; with required fittings.
- B. Use perforated pipe at subdrainage system; unperforated through sleeved walls.

2.02 AGGREGATE AND BEDDING

- A. See Section 31 23 23 - Fill for Type C underdrain stone.

2.03 ACCESSORIES

- A. Pipe Couplings: Solid plastic.
- B. Geotextile Fabric: See Section 31 23 23 - Fill for non-woven geotextile.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

3.02 PREPARATION

- A. Hand trim excavations to required elevations. Correct over-excavation with Type C Underdrain stone.
- B. Remove large stones or other hard matter that could damage drainage piping or impede consistent backfilling or compaction.

3.03 INSTALLATION

- A. Install and join pipe and pipe fittings in accordance with pipe manufacturer's instructions.
- B. Place 6 inches of Type C Underdrain Stone over non-woven geotextile.
- C. Place pipe with perforations facing down. Mechanically join pipe ends.
- D. Install pipe couplings.
- E. Install Type C Underdrain Stone at sides, over joint covers and top of pipe. Provide top cover and sides a compacted thickness of 6 inches.
- F. Wrap filter fabric over levelled top surface of aggregate cover prior to subsequent backfilling operations.
- G. Place aggregate in maximum 4 inch lifts, consolidating each lift.
- H. Refer to Section 31 23 23 for compaction requirements. Do not displace or damage pipe when compacting.
- I. Place impervious fill over drainage pipe aggregate cover and compact.
- J. Connect to storm sewer system with unperforated pipe .

3.04 FIELD QUALITY CONTROL

- A. Section 01 40 00 - Quality Requirements: Field inspection and testing.
- B. Request inspection prior to and immediately after placing aggregate cover over pipe.

3.05 PROTECTION

- A. Protect pipe and aggregate cover from damage or displacement until backfilling operation begins.

END OF DOCUMENT 33 41 00

SECTION 33 42 11 - STORMWATER GRAVITY PIPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Storm drainage piping, fittings, and accessories.
- B. Foundation drainage piping and accessories.
- C. Subsurface Detention System.

1.02 RELATED REQUIREMENTS

- A. Section 31 23 16 - Excavation: Excavating of trenches.
- B. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.
- C. Section 31 23 23 - Fill: Bedding and backfilling.
- D. Section 33 05 13 - Manholes and Structures.

1.03 REFERENCE STANDARDS

- A. AASHTO M252 - Standard Specification For Corrugated Polyethylene Pipe, 75 mm to 250mm; 2009.
- B. AASHTO M254 - Standard Specification For Corrugated Polyethylene Pipe, 300 mm to 1,500mm; 2009.
- C. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2015.
- D. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2012.
- E. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015.
- F. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2014.
- G. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.
- H. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2015.

1.04 SUBMITTALS

- A. Product Data: Provide data indicating pipe, pipe accessories .
- B. Project Record Documents:
 - 1. Record location of pipe runs, connections, catch basins, cleanouts, and invert elevations.
 - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
 - 3. Record location of subsurface detention system.

1.05 PROJECT CONDITIONS

- A. Coordinate the Work with termination of storm sewer connection outside building, trenching, connection to foundation drainage system.

PART 2 PRODUCTS

2.01 STORM DRAIN PIPE MATERIALS

- A. Reinforced Concrete Pipe: ANSI/ASTM C76, IV, with modified tongue-and-groove compression gasket joints complying with ANSI/ASTM C443.
- B. Reinforced Concrete Pipe Joint Device: ASTM C 443 rubber compression gasket joint.
- C. High Performance Polypropylene (HPPP) Pipe: Pipe shall meet the requirements MaineDOT Section 706.06 with the following additions and modifications.
 - 1. 12" through 30" pipe shall have a smooth interior and annular exterior corrugations.
 - 2. 12" through 30" dual wall pipe shall meet ASTM F2881 or AASHTO M330.
 - 3. Polypropylene compound for pipe and fitting production shall be impact modified copolymer meeting the material requirements of ASTM F2881, Section 5 and AASHTO M330, Section 6.1.
 - 4. Pipe shall be joined with a gasketed integral bell and spigot joint meeting the requirements of ASTM F2881 or AASHTO M330.
 - 5. 12" through 30" joints shall be watertight according to the requirements of ASTM D3212. Spigots shall have gaskets meeting the requirements of ASTM F477. Gasket shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly.
 - 6. 12" through 30" diameters shall have an exterior bell wrap installed by the manufacturer.
 - 7. Fittings shall conform to ASTM F2881 or AASHTO M330. Bell and spigot connections shall utilize a welded or integral bell and valley or inline gaskets meeting the watertight joint performance requirements of ASTM D3212.
 - 8. Pipe must have minimum pipe stiffness (PS) of 46 at 5% deflection. Larger sizes shall be Triple Wall SaniTite.
 - 9. Corrugated couplings shall be split collar, engaging at least two (2) full corrugations. Acceptable Manufacturers include:
 - a. Advanced Drainage Systems (HP Storm Pipe)
 - b. Or equal to above
- D. High Density Polypropylene (HPPP) SaniTite Pipe: Pipe shall meet the requirements of MaineDOT Standard Specifications Section 706.6 with the following additions and modifications.
 - 1. 12" through 30" (300 to 750mm) SaniTite HP dual pipe shall have a smooth interior and annular exterior corrugations; 30"-60" SaniTite HP triplewall pipe shall have smooth interior and exterior surfaces with annular inner corrugations.
 - 2. 12" through 30" dual wall pipe shall meet ASTM F2736
 - 3. 30" through 60" triple wall pipe shall meet ASTM F2764
 - 4. Pipe shall be joined with a gasketed integral bell & spigot joint meeting the requirements of ASTM F2736.
 - 5. 12" through 60" shall be watertight according to the requirements of ASTM D3212, with the addition of a 15 psi pressure requirement. Spigot shall have two gaskets meeting the requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gaskets are free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly.
 - 6. 12" through 60" diameters shall have a reinforced bell with a polymer composite band installed by the manufacturer
 - 7. Pipe must have a minimum pipe stiffness (PS) of 46 @ 5% deflection.

8. Fittings and connections shall provide a watertight connection according to the requirements of ASTM D3212. Gaskets, when present, shall meet ASTM F477
 9. Acceptable Manufacturers include:
 - a. Advanced Drainage Systems
 - b. Or equal to above
 - E. Polyvinyl Chloride Pipe (PVC) SDR 35 Pipe: Pipe shall meet the following requirements.
 1. PVC SDR-35 pipe shall be Ring Type Sewer Pipe SDR-35.
 2. PVC SDR-35 pipe shall meet ASTM D3034 for sizes 4" thru 15".
 3. PVC SDR-35 shall meet ASTM F-679 for sizes 18" thru 27".
 4. PVC SDR-35 rubber seals shall meet ASTM D 3212.
 5. PVC Schedule 80 shall meet ASTM D 1785
 6. All fittings and pipe shall have a water-tight push on joint and must meet the ASTM D3034 and ASTM D3212 standards.
 7. Minimum "pipe stiffness" at 4% deflection shall be 46 psi for all sizes when tested in accordance with ASTM D2421.
 8. All fittings and connectors shall meet ASTM D3034 and ASTM D 3212 Standards.
 9. Joints shall be push-on rubber gasketed "Bell and Spigot" type joints using factory installed elastomeric ring gaskets. The gaskets shall be securely fixed into place by the manufacturer so that they cannot be dislodged during joint assembly.
 10. The gaskets shall be of a composition and texture that is resistant to common ingredients of storm sewer, including oils and groundwater, and that will permanently endure the conditions of the proposed use.
 11. Where perforated pipe is used perforations will be 1/2" holes every 5" on center and two rows at 120° apart.
 12. Acceptable Manufacturers include:
 - a. J-M Manufacturing
 - b. IPEX
 - c. Or equal to above
 - F. Building foundation drain: 4" dia. SDR-35 perforated underdrain pipe.
- 2.02 PIPE ACCESSORIES
- A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.
- 2.03 SUBSURFACE DETENTION FACILITY
- A. Subsurface Detention Chambers: Chambers shall be SC-740 size units as manufactured by Stormtech, LLC.

PART 3 EXECUTION

3.01 TRENCHING

- A. See Section 31 23 16.13 for additional requirements.
- B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.02 INSTALLATION - PIPE

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.

- B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
 - 1. Plastic Pipe: Also comply with ASTM D2321.
- C. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- D. Connect to building storm drainage system, foundation drainage system, and utility/municipal stormdrain system.

3.03 INSTALLATION - CATCH BASINS, TRENCH DRAINS AND CLEANOUTS

- A. See Section 33 05 13 "Manholes and Structures"

3.04 INSTALLATION - SUBSURFACE DETENTION

- A. Stormtech units shall be installed per the manufacturers specifications.

3.05 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with requirements of local authorities having jurisdiction.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.

3.06 PROTECTION

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

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