

SECTION 00 01 01

RFB #CPPM2026-011

PROJECT MANUAL

FOR

UM DEMERITT FOREST SAWMILL

UNIVERSITY OF MAINE

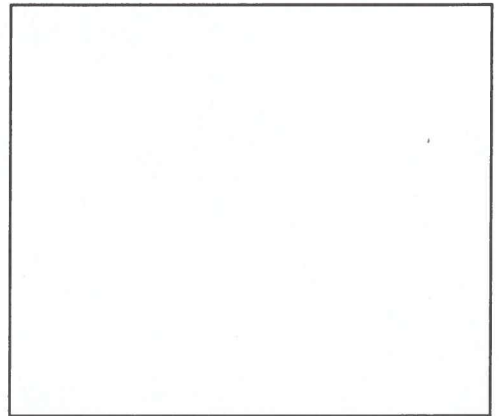
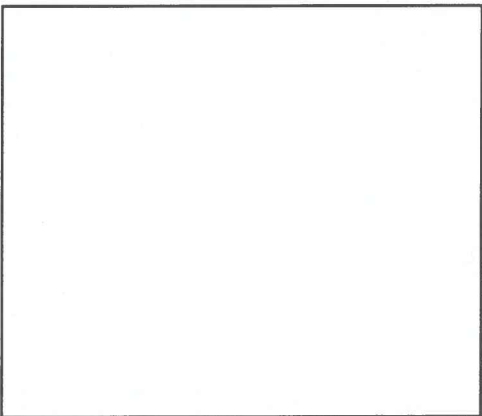
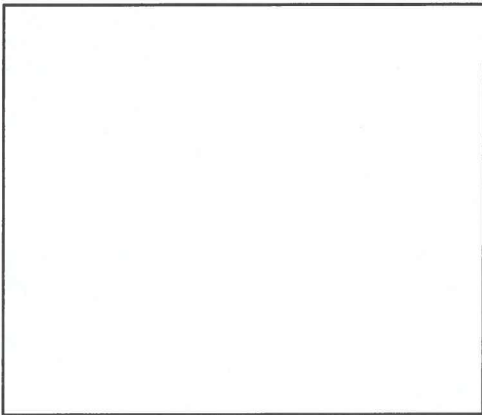
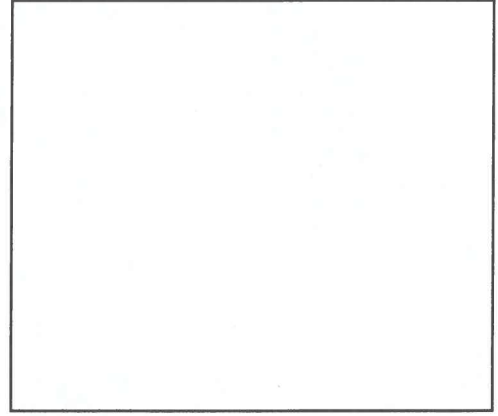
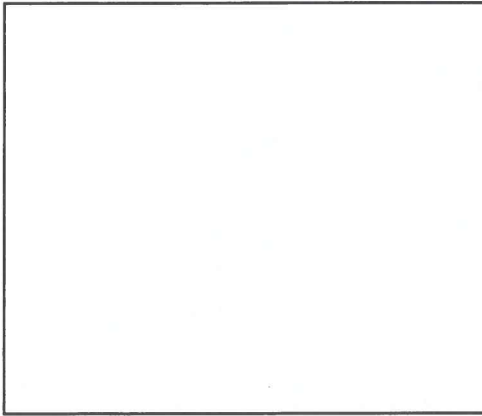
January 31, 2026

Prepared by:

University of Maine System
&
Carpenter Associates

END OF SECTION 00 01 01

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SEALS PAGE



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FP1A.	FIRE PROTECTION PLAN (ALTERNATE 3)

END OF SECTION 00 01 15

SECTION 00 11 13
ADVERTISEMENT FOR BIDS

Bids for: **UM DEMERITT FOREST SAWMILL**

Shall be submitted electronically to cppmquestions@maine.edu
With the following Email Subject Line: **UM Demeritt Forest Sawmill**

Bids will be received until **2:00PM** on **Thursday, February 26, 2026** at which time Bids will be opened and read aloud via Zoom.

Bid opening attendance is available via PC, Mac, Linux, iOS or Android:
[Zoom https://maine.zoom.us/j/84184032596?pwd=JQ3vdFWtAjN6haFjHkUWtvhRbX3qeJ.1&jst=2](https://maine.zoom.us/j/84184032596?pwd=JQ3vdFWtAjN6haFjHkUWtvhRbX3qeJ.1&jst=2)
Password: 015643
Or via telephone US: [\(US\) +1 646-876-9923](tel:+16468769923)
Meeting ID: 84184032596

Bids received after the stated time will not be considered and will be returned unopened.

Electronic bid submission must be accompanied by a copy of a satisfactory Bid Bond for 5% of the Bid (checks will not be accepted) which shall be in conformity with the form of Bond contained in Section 00 43 13 of the Specifications. Upon determination of the apparent low bidder, the University will contact the low bidder and request an original hard copy of the bid bond be delivered within 72 hours. The University reserves the right to waive all formalities and reject any or all bids or to accept any bids. Scholarships, donations or gifts to the University will not be considered in the evaluation of responses.

Electronic Bid Submission Requirements:

A **SIGNED** virus-free electronic bid form must be submitted as follows:

- The bid and bid bond must be submitted electronically as a single PDF file to the email address shown above.
- Electronic submission must be received by the required **Date/Time** reflected above.

The successful Bidder will be required to furnish a 100% Performance Bond and a 100% Payment Bond to cover the execution of the Contract which shall be in conformity with the form of Bonds contained in Sections 00 61 13.13 and 00 61 13.16, respectively, of the Specifications and shall be for the Contract amount.

Bidders may attend a non-mandatory pre-bid meeting on Tuesday, February 10, 2026 at 10:00AM. Attendees are to meet in the FM Service Building Room 109 conference room. Copies of plans and specifications will not be available at the pre-bid meeting. Acquiring or reviewing plans and specifications prior to the meeting is advised.

Project Summary: The project consists of new construction of a single classroom and pavilion space for portable sawmill training.

Any questions related to the plans and specifications must be submitted prior to 4:00PM on Thursday, February 12, 2026, via email to Nick Ramsey, Project Manager, University of Maine;
cppmquestions@maine.edu

The University of Maine System is an EEO/AA institution and does not discriminate on the grounds of race, color, religion, sex, sexual orientation, transgender status, gender, gender identity or expression, ethnicity, national origin, citizenship status, familial status, ancestry, age, disability physical or mental, genetic information, veteran or military status in employment, education, and all other programs and activities. The following person has been designated to handle inquiries regarding non-discrimination policies: Director of Equal Opportunity, 5713 Chadbourne Hall, Room 412, University of Maine, Orono, ME 04469-5754, 207.581.1226, TTY 711 (Maine Relay System). The University provides reasonable accommodation to qualified individuals with disabilities upon request. General contractors, subcontractors, and product suppliers bidding on this project must subscribe and adhere to the same.
UNIVERSITY OF MAINE SYSTEM

by and through
UNIVERSITY OF MAINE
Jenny Boyden, Vice President of Finance and Chief Business Officer, for
University of Maine System Board of Trustees

END OF SECTION 00 11 13

SECTION 00 21 13
INSTRUCTIONS TO BIDDERS

1. At the time of the opening of bids, each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the plans and contract documents, including all addenda. The failure or omission of any bidder to receive or examine any form, instrument, or document shall not relieve any bidder from any obligation in respect to the bid. The Owner reserves the right to accept or reject any or all bids as may best serve the interests of the University of Maine System.
2. Subject to the University System's right, reserved herein, to accept or reject any or all bids, the General Contractor will be selected on the basis of the sum of the lowest base bid, plus such of the alternates as the University System desires to use.
3. The University System is exempt from the payment of Federal Excise Taxes on articles not for resale and the Federal Transportation Tax on all shipments. The Contractor shall quote less these taxes. Upon application, exemption certificates will be furnished when required.
4. No proposal may be withdrawn during a period of thirty (30) calendar days immediately following the opening thereof.
5. No contract may be assigned, sublet or transferred without the written consent of the University of Maine System.
6. All individuals not residents of this State must comply with the provisions of 14 MRSA §704-A.
7. The successful bidder, or bidders, will be required to furnish 100% Contract Bonds to cover the execution of the contract, in accordance with the AIA Document A101 - 2017 Exhibit A and Article 11 of the AIA Document A201 – 2017 General Conditions of the Contract for Construction.
8. Contractors may be required to furnish a statement of their business experience, record of accomplishments, and financial responsibility, at the discretion of the University System.
9. The base bid shall be based on the materials, methods, equipment and products, as specified.
10. Bidders shall submit the bid on the Bid Form provided in the Specifications, Section 00 41 13.
11. Any materials, methods, equipment and products not herein specified, but worthy of consideration by any General or Subcontractor, may be introduced by a separate letter attached to the regular bid. The Bidder shall state the cost comparison with the specified materials, methods, equipment and products, and the reason for the suggested substitution. It shall be understood by all bidders that the attached letter proposing substitutions shall not be used to determine the low bidder and that all bids are based on specified products.
12. Telegraphic or facsimile proposals will not be considered, but modification of proposals already submitted will be considered if received prior to the hour set for receipt of proposals. If the telegram or facsimile discloses the amount of the proposal, the proposal will be declared invalid. The bidder bears full responsibility to assure that the correction is delivered to the proper location and within the time required.
13. Where a bidder wishes a product to be considered an "approved equal" for bidding purposes, the product, along with all supporting documentation, shall be submitted to the architect for review a minimum of 10 calendar days prior to the bid opening date or the file bid due date, if file bids are required on the project. Products which are determined to be an "approved equal" for bidding purposes shall be listed in an addendum issued so as to be received by bidders no less than 72 hours prior to the bid date or the file bid due date if file bids are required.
14. Where the Bid Form requires the tabulation of subcontractors other than "File Bidders," the Bidder shall list the name of the firm the bidder intends to use in the event the bidder receives the contract award.
15. Bidders may appeal the award decision by submitting a written protest to the University of Maine System

Chief Facilities and General Services Officer within five (5) business days of the date of the award notice (Notice of Award) with a copy of the protest to the successful bidder. The protest must contain a statement of the basis for the challenge.

END OF SECTION 00 21 13

SECTION 00 41 13
BID FORM – SHORT FORM

BIDDER: _____
Physical/Street Address _____
City, State ZIP _____

University of Maine
Office of Facilities Management
Orono ME 04469-5765

Having carefully examined the form of contract, general conditions and plans and specifications contained therein for UM Demeritt Forest Sawmill, as well as the premises and conditions affecting the work, we the undersigned propose to furnish all labor, equipment, and materials necessary for and reasonably incidental to the construction and completion of this contract for the base bid sum of _____ Dollars (\$ _____).

Alternate prices as follows:

Alternate 1. Gravel base in lieu of concrete slab \$ _____
Alternate 2. Curtain fabric & hardware \$ _____
Alternate 3. ERV-1 and ductwork \$ _____

This proposal includes the cost of 100% Performance Bond plus 100% Payment Bond.

The receipt of the following addenda to plans and specifications is hereby acknowledged:

ADDENDUM # _____ DATED _____ ADDENDUM # _____ DATED _____
ADDENDUM # _____ DATED _____ ADDENDUM # _____ DATED _____

Any material or materials not specified in the bidding document but worthy of consideration may be introduced by the bidder by a separate letter attached to this Bid. A cost comparison must be included giving the comparison with the Material specified and the reason for the suggested substitution. The basic bid shall be as specified.

The undersigned agrees, if this Bid is accepted to sign a contract and deliver it, along with the bonds and affidavits for all insurance specified within twelve (12) calendar days after the date of notification of such acceptance, except if the 12th day falls on a Saturday, Sunday or holiday, then the conditions will be fulfilled if the required documents are received before 12 o'clock noon on the day following the holiday, or the Monday following the Saturday or Sunday, and as a guarantee thereof, herewith submits a bid bond as required.

The undersigned agrees, if awarded the Contract, to substantially complete the work on or before December 31, 2026. The undersigned also agrees, if awarded the Contract, that no more than 80% of the contract amount will be sublet to other contractors.

Signed (by individual authorized to sign contract) _____

By (printed name & title) _____ Phone _____

PO Box (if applicable) _____ Email _____

NOTE: If bidder is a corporation, write State of Incorporation, and if a partnership, give full names of all partners.

END OF SECTION 00 41 13

SECTION 00 43 13

BID SECURITY FORM

KNOW ALL BY THESE PRESENTS, THAT WE, the undersigned, as PRINCIPAL _____
_____, and _____
_____ as SURETY, are hereby held and firmly bound unto the Treasurer
of the UNIVERSITY OF MAINE SYSTEM in the penal sum of _____
_____ 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 _____ day of _____, 20 _____.

The condition of the above obligation is such that whereas the Principal has submitted to UNIVERSITY OF
MAINE SYSTEM, BY AND THROUGH THE UNIVERSITY OF MAINE, a certain proposal, attached hereto
and hereby made a part hereof, to enter into a contract in writing for the
[and INSERT PROJECT NAME HERE].

NOW THEREFORE,

- (a) If said proposal shall be rejected, or, in the alternate
- (b) If said proposal 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 proposal) and shall furnish a bond for
faithful performance of said contract, and for the payment of all persons performing labor or furnishing
materials in connection therewith, and shall in all other respects perform the agreement created by the
acceptance of said proposal, 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 bond shall
be in no way impaired or affected by any extension of the time within which the principal may accept such
proposal: and said Surety does hereby waive notice of any such extension.

In the event suit is brought upon this bond by the Treasurer of the UNIVERSITY OF MAINE SYSTEM, Surety
shall pay reasonable attorneys' fees and costs incurred by the Treasurer of the UNIVERSITY OF MAINE
SYSTEM in such suit.

IN WITNESS WHEREOF, the Principal and 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.

PRINCIPAL: _____

By: _____
L.S.

SURETY: _____

SURETY ADDRESS: _____

By: _____
L.S.

****DO NOT ALTER LANGUAGE****

END OF SECTION 00 43 13

SECTION 00 51 00

NOTICE OF AWARD

DATE

Vendor Name
Vendor Address.
Vendor Address

RE: ***NOTICE OF AWARD – PROJECT NAME***
UNIVERSITY OF MAINE

Dear (vendor name),

You are hereby notified that the University of Maine System, by and through the University of Maine, accepts your Bid of **\$00.00** for the above named project, subject to final resolution of any bid protests and the parties' ability to establish and confirm final terms, as well as the execution of a written contract and your furnishing satisfactory bonds within twelve (12) calendar days as provided in the bidding documents.

This Notice of Award will permit you to proceed with the ordering of materials and scheduling the work so that the project can be completed on time. Should you fail to execute a contract or furnish satisfactory bonds within the stipulated time, the bid bond accompanying your proposal will be forfeited to the University of Maine System as liquidated damages.

Enclosed is your contract agreement for signature. Further, please have your surety provide one original each of the Performance Bond and the Payment Bond, as prescribed in Sections 00 61 13.13 and 00 61 13.16 of the bid document, and a properly executed "Power of Attorney." Please advise your surety agent that the bonds should carry the same date as this Notice of Award and the Contract Agreement. **All originals of the signed contract, bonds and insurance certificates should be forwarded directly to Sandra Binette, Capital Contracts Administrator, 5765 Service Building, Orono, ME 04469.** Once it is completely signed, a copy of the contract will be returned for your use.

Prior to the start of any work on the construction site, Capital Planning and Project Management must receive Certificates of Liability Insurance as specified in Article A.3 of the AIA Document A101 – 2017 Exhibit A, Insurance and Bonds. Please advise your surety that the certificate holder should be as follows: University of Maine System; Office of Risk Management; Robinson Hall, 46 University Drive, Augusta, ME 04330.

The day-to-day administrative and technical details of this project will be handled by the Architect/Engineer, insert name here. All correspondence relative to the day-to-day administration of the project should be directed to insert name, insert title, insert email; 207-000-0000.

A pre-construction conference on this project will be scheduled as soon as possible. This conference must be attended by your firm's authorized representative as well as your project superintendent.

Sincerely,

Jenny Boyden
Vice President of Finance
& Chief Business Officer

Enclosures

END OF SECTION 00 51 00

UNIVERSITY OF MAINE SYSTEM
Construction Contract Agreement

THIS AGREEMENT is made and entered into the _____ day of _____, 20____, by and between the Contractor, _____, and the University of Maine System acting by and through the University of Maine, 5765 Service Building, Orono, ME 04469, hereinafter called the Owner.

WITNESSETH: That the Owner and the Contractor for the considerations hereinafter named agree as follows:

ARTICLE 1. SCOPE OF THE WORK

The Contractor shall furnish all of the materials and perform all of the work described in the Contract Documents entitled [INSERT PROJECT NAME HERE], prepared by [Insert name of Architect/Engineer here], acting as and in these Contract Documents entitled the Architect and/or Engineer.

ARTICLE 2: START AND TIME OF COMPLETION

The date of the commencement of work shall be the date of this Agreement and shall be substantially completed on or before _____ subject to adjustments as provided in the Contract Documents.

The Contractor and the Contractor's surety, if any, shall be liable for and shall pay the Owner the following stipulated liquidated damages for each calendar day of delay after the date established for Substantial Completion until the Work is substantially complete: _____ Dollars (\$____) per calendar day.

ARTICLE 3: THE CONTRACT SUM

The Owner shall pay the Contractor for the performance of the Contract as follows _____ Dollars, \$ (____), subject to adjustments as provided in the Contract Documents.

The Contract Sum is based upon the following Alternates and Unit Prices, if any, which are described in the Contract Documents and are hereby accepted by the Owner:

Alternate (1) _____	Alternate (2) _____	Alternate (3) _____
Unit Prices		
Item _____	Price _____	
Item _____	Price _____	

Final payment shall be made after completion and acceptance of the work as provided in the Contract Documents.

ARTICLE 4: THE CONTRACT DOCUMENTS

The Contract Documents for this project, except for modifications issued after execution of this agreement, consist of:

- .1 This agreement.
- .2 AIA Document A201-2017, General Conditions of the Contract for Construction, as modified by the Owner.
- .3 AIA A101 – 2017, Exhibit A, Insurance and Bonds, as modified by the Owner.

- .4 The Specifications as outlined in the Project Manual: [Insert Name of Project Here], dated _____.
- .5 The Drawings as listed in the Project Manual.
- .6 The Addenda: Addendum 01 dated _____.
- .7 Exhibit B, Contractor's Proposal dated _____.

ARTICLE 5: OWNER'S REPRESENTATIVES

The Owner's Representative on this project will be _____, who is authorized to sign contracts and other legal documents related to this project on behalf of the Owner.

The Owner's Project Manager on this project will be _____.

The Owner and the Contractor hereby agree to the full performance of the covenants herein.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement on the day and year first above written.

UNIVERSITY OF MAINE SYSTEM
by and through
University of Maine

Company

Company

By: _____
[Insert Signatory Name]
[Insert Signatory Title]
University of Maine

By: _____

END OF SECTION 00 52 13

SECTION 00 61 13.13

PERFORMANCE BOND FORM

Bond No. _____

KNOW ALL BY THESE PRESENTS THAT (1) _____
(2) _____
of _____ and State of _____, as PRINCIPAL,
and (3) _____
a corporation duly organized under the laws of the State of _____ and
having a usual place of business in _____, as SURETY, are held
and firmly bound unto the University of Maine System in the sum of _____ Dollars
(\$ _____), to be paid said Treasurer of the University of Maine System, or successor
in office, for which payment well and truly to be made, Principal and Surety bind themselves, their heirs,
executors and administrators, successors and assigns, jointly and severally by these presents.

The condition of this obligation is such that if the Principal shall promptly and faithfully perform the Contract
entered into on the (4) _____ day of _____, A.D., 20____ for the
construction of (5) _____

then this obligation shall be null and void; otherwise, it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the University of Maine
System.

Signed and sealed this (4) _____ day of _____, 20____.

WITNESSES:

SIGNATURES:

_____ LS
_____ LS
_____ LS

Bonding Company Agent:

Company: _____

Street: _____

City, State, Zip: _____

Telephone: _____

- (1) Correct name of Contractor.
- (2) A corporation, a partnership, or an individual, as the case may be.
- (3) Correct name of Surety.
- (4) Same date as that of contract.
- (5) Name of Project as designated in contract.

If Contractor is a partnership, all partners should execute bond. A Power of Attorney document, together with a
statement that it still is in effect shall be provided by the person executing this bond. Bond must be
countersigned by a Resident Maine Agent.

****DO NOT ALTER LANGUAGE****

END OF SECTION 00 61 13.13

SECTION 00 61 13.16
PAYMENT BOND FORM

Bond No. _____

KNOW ALL BY THESE PRESENTS THAT (1) _____
_____ (2) _____
of _____ and State of _____, as PRINCIPAL,
and (3) _____,
a corporation duly organized under the laws of the State of _____ and
having a usual place of business in _____, as SURETY, are held
and firmly bound unto the University of Maine System in the sum of _____ Dollars
(\$ _____), for the use and benefit of claimants* as herein below defined, for the
payment whereof Principal and Surety bind themselves, their heirs, executors and administrators, successors
and assigns, jointly and severally by these presents.

The condition of this 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 contemplated
in the Contract entered into on the (4) _____ day of _____, A.D., 20 _____ for the
construction of (5) _____

_____,
and shall fully reimburse the obligee for all outlay and expense which said obligee may incur in making good
any default of said principal, then this obligation shall be null and void; otherwise, it shall remain in full force
and effect.

*A Claimant is defined as one having a direct contract with the Principal or with a subcontractor of the
Principal for labor, material, or both, used or reasonably required for use in the performance of the contract.

Signed and sealed this (6) _____ day of _____, 20 _____.

WITNESSES:

SIGNATURES:

_____ LS
_____ LS
_____ LS

Bonding Company Agent:

Company: _____

Street: _____

City, State, Zip: _____

Telephone: _____

- (1) Correct name of Contractor.
- (2) A corporation, a partnership, or an individual, as the case may be.
- (3) Correct name of Surety.
- (4) Same date as that of contract.
- (5) Name of Project as designated in contract.
- (6) Same date as that of Contract.

If contractor is a partnership, all partners should execute bond. A Power of Attorney document, together with a
statement that it still is in effect shall be provided by the person executing this bond. Bond must be
countersigned by a Resident Maine Agent.

****DO NOT ALTER LANGUAGE****

END OF SECTION 00 61 13.16



AIA® Document G715™ – 2017

Supplemental Attachment for ACORD Certificate of Insurance 25

PROJECT: <i>(name and address)</i> Samples	CONTRACT INFORMATION: Contract For: Date:	CERTIFICATE INFORMATION: Producer: Insured: Date:
OWNER: <i>(name and address)</i> University of Maine System by and through University of Maine 5765 Service Building Orono, ME 04469	ARCHITECT: <i>(name and address)</i>	CONTRACTOR: <i>(name and address)</i>

A. General Liability	Yes	No	N/A
1. Does this policy include coverage for:			
a Damages because of bodily injury, sickness, or disease, including occupational sickness or disease, and death of any person?	☐	☐	☐
b Personal injury and advertising injury?	☐	☐	☐
c Damages because of physical damage to or destruction of tangible property, including the loss of use of such property?	☐	☐	☐
d Bodily injury or property damage arising out of completed operations?	☐	☐	☐
e The Contractor's indemnity obligations included in the Contract Documents?	☐	☐	☐
2. Does this policy contain an exclusion or restriction of coverage for:			
a Claims by one insured against another insured, where the exclusion or restrictions is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim?	☐	☐	☐
b Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor?	☐	☐	☐
c Claims for bodily injury other than to employees of the insured?	☐	☐	☐
d Claims for the Contractor's indemnity obligations included in the Contract Documents arising out of injury to employees of the insured?	☐	☐	☐
e Claims for loss excluded under a prior work endorsement or other similar exclusionary language?	☐	☐	☐
f Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language?	☐	☐	☐
g Claims related to residential, multi-family, or other habitational projects?	☐	☐	☐
h Claims related to roofing?	☐	☐	☐
i Claims related to exterior insulation finish systems, synthetic stucco, or similar exterior coatings or surfaces?	☐	☐	☐
j Claims related to earth subsistence or movement?	☐	☐	☐
k Claims related to explosion, collapse, and underground hazards?	☐	☐	☐
B. Other Insurance Coverage	Yes	No	N/A
1. Indicate whether the Contractor has the following insurance coverages and, if so, indicate the coverage limits for each.			
a Professional liability insurance	☐	☐	☐
Coverage limits:			
b Pollution liability insurance	☐	☐	☐

- Coverage limits:
- c** Insurance for maritime liability risks associated with the operation of a vessel ☐ ☐ ☐
- Coverage limits:
- d** Insurance for the use or operation of manned or unmanned aircraft ☐ ☐ ☐
- Coverage limits:
- e** Property insurance ☐ ☐ ☐
- Coverage limits:
- f** Railroad protective liability insurance ☐ ☐ ☐
- Coverage limits:
- g** Asbestos abatement liability insurance ☐ ☐ ☐
- Coverage limits:
- h** Insurance for physical damage to property while it is in storage and in transit to the construction site ☐ ☐ ☐
- Coverage limits:
- i** Other: ☐ ☐ ☐

(Authorized Representative)

(Date of Issue)

ACORDTM CERTIFICATE OF LIABILITY INSURANCE		DATE (MM/DD/YY)
PRODUCER	THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.	
	INSURERS AFFORDING COVERAGE	
INSURED	INSURER A: INSURER B: INSURER C: INSURER D: INSURER E:	

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS								
	GENERAL LIABILITY ☐ COMMERCIAL GENERAL LIABILITY ☐ CLAIMS MADE ☐ OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: ☐ POLICY ☐ PRO-JECT ☐ LOC				EACH OCCURRENCE \$ FIRE DAMAGE (Any one fire) \$ MED EXP (Any one person) \$ PERSONAL & ADV INJURY \$ GENERAL AGGREGATE \$ PRODUCTS - COMP/OP AGG \$								
	AUTOMOBILE LIABILITY ☐ ANY AUTO ☐ ALL OWNED AUTOS ☐ SCHEDULED AUTOS ☐ HIRED AUTOS ☐ NON-OWNED AUTOS				COMBINED SINGLE LIMIT (Ea accident) \$ BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$								
	GARAGE LIABILITY ☐ ANY AUTO				AUTO ONLY - EA ACCIDENT \$ OTHER THAN EA ACC \$ AUTO ONLY: AGG \$								
	EXCESS LIABILITY ☐ OCCUR ☐ CLAIMS MADE ☐ DEDUCTIBLE ☐ RETENTION \$				EACH OCCURRENCE \$ AGGREGATE \$ \$ \$ \$								
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY				<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">WC STATU-TORY LIMITS</td> <td style="width: 40%;">OTH-ER</td> </tr> <tr> <td>E.L. EACH ACCIDENT</td> <td>\$</td> </tr> <tr> <td>E.L. DISEASE - EA EMPLOYEE</td> <td>\$</td> </tr> <tr> <td>E.L. DISEASE - POLICY LIMIT</td> <td>\$</td> </tr> </table>	WC STATU-TORY LIMITS	OTH-ER	E.L. EACH ACCIDENT	\$	E.L. DISEASE - EA EMPLOYEE	\$	E.L. DISEASE - POLICY LIMIT	\$
WC STATU-TORY LIMITS	OTH-ER												
E.L. EACH ACCIDENT	\$												
E.L. DISEASE - EA EMPLOYEE	\$												
E.L. DISEASE - POLICY LIMIT	\$												
	OTHER												

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/EXCLUSIONS ADDED BY ENDORSEMENT/SPECIAL PROVISIONS

University of Maine System is named an additional insured under General Liability.
 Project:

CERTIFICATE HOLDER

ADDITIONAL INSURED; INSURER LETTER: _____

CANCELLATION

University of Maine System
 Office of Risk Management
 Robinson Hall
 46 University Drive
 Augusta, ME 04330

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL _____ DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE

IMPORTANT

If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

DISCLAIMER

The Certificate of Insurance on the reverse side of this form does not constitute a contract between the issuing insurer(s), authorized representative or producer, and the certificate holder, nor does it affirmatively or negatively amend, extend or alter the coverage afforded by the policies listed thereon.

Sample

COMMERCIAL GENERAL LIABILITY COVERAGE FORM

Various provisions in this policy restrict coverage. Read the entire policy carefully to determine rights, duties and what is and is not covered.

Throughout this policy the words "you" and "your" refer to the Named Insured shown in the Declarations, and any other person or organization qualifying as a Named Insured under this policy. The words "we", "us" and "our" refer to the company providing this insurance.

The word "insured" means any person or organization qualifying as such under Section II – Who Is An Insured.

Other words and phrases that appear in quotation marks have special meaning. Refer to Section V – Definitions.

SECTION I – COVERAGES

COVERAGE A BODILY INJURY AND PROPERTY DAMAGE LIABILITY

1. Insuring Agreement

- a. We will pay those sums that the insured becomes legally obligated to pay as damages because of "bodily injury" or "property damage" to which this insurance applies. We will have the right and duty to defend the insured against any "suit" seeking those damages. However, we will have no duty to defend the insured against any "suit" seeking damages for "bodily injury" or "property damage" to which this insurance does not apply. We may, at our discretion, investigate any "occurrence" and settle any claim or "suit" that may result. But:

- (1) The amount we will pay for damages is limited as described in Section III – Limits Of Insurance; and
- (2) Our right and duty to defend ends when we have used up the applicable limit of insurance in the payment of judgments or settlements under Coverages A or B or medical expenses under Coverage C.

No other obligation or liability to pay sums or perform acts or services is covered unless explicitly provided for under Supplementary Payments – Coverages A and B.

- b. This insurance applies to "bodily injury" and "property damage" only if:

- (1) The "bodily injury" or "property damage" is caused by an "occurrence" that takes place in the "coverage territory";
- (2) The "bodily injury" or "property damage" occurs during the policy period; and
- (3) Prior to the policy period, no insured listed under Paragraph 1. of Section II – Who Is An Insured and no "employee" authorized by you to give or receive notice of an "occurrence" or claim, knew that the "bodily injury" or "property damage" had occurred, in whole or in part. If such a listed insured or authorized "employee" knew, prior to the policy period, that the "bodily injury" or "property damage" occurred, then any continuation, change or resumption of such "bodily injury" or "property damage" during or after the policy period will be deemed to have been known prior to the policy period.

- c. "Bodily injury" or "property damage" which occurs during the policy period and was not, prior to the policy period, known to have occurred by any insured listed under Paragraph 1. of Section II – Who Is An Insured or any "employee" authorized by you to give or receive notice of an "occurrence" or claim, includes any continuation, change or resumption of that "bodily injury" or "property damage" after the end of the policy period.

- d. "Bodily injury" or "property damage" will be deemed to have been known to have occurred at the earliest time when any insured listed under Paragraph 1. of Section II – Who Is An Insured or any "employee" authorized by you to give or receive notice of an "occurrence" or claim:

- (1) Reports all, or any part, of the "bodily injury" or "property damage" to us or any other insurer;
- (2) Receives a written or verbal demand or claim for damages because of the "bodily injury" or "property damage"; or
- (3) Becomes aware by any other means that "bodily injury" or "property damage" has occurred or has begun to occur.

- e. Damages because of "bodily injury" include damages claimed by any person or organization for care, loss of services or death resulting at any time from the "bodily injury".

2. Exclusions

This insurance does not apply to:

a. Expected Or Intended Injury

"Bodily injury" or "property damage" expected or intended from the standpoint of the insured. This exclusion does not apply to "bodily injury" resulting from the use of reasonable force to protect persons or property.

b. Contractual Liability

"Bodily injury" or "property damage" for which the insured is obligated to pay damages by reason of the assumption of liability in a contract or agreement. This exclusion does not apply to liability for damages:

- (1) That the insured would have in the absence of the contract or agreement; or
- (2) Assumed in a contract or agreement that is an "insured contract", provided the "bodily injury" or "property damage" occurs subsequent to the execution of the contract or agreement. Solely for the purposes of liability assumed in an "insured contract", reasonable attorney fees and necessary litigation expenses incurred by or for a party other than an insured are deemed to be damages because of "bodily injury" or "property damage", provided:
 - (a) Liability to such party for, or for the cost of, that party's defense has also been assumed in the same "insured contract"; and
 - (b) Such attorney fees and litigation expenses are for defense of that party against a civil or alternative dispute resolution proceeding in which damages to which this insurance applies are alleged.

c. Liquor Liability

"Bodily injury" or "property damage" for which any insured may be held liable by reason of:

- (1) Causing or contributing to the intoxication of any person;
- (2) The furnishing of alcoholic beverages to a person under the legal drinking age or under the influence of alcohol; or
- (3) Any statute, ordinance or regulation relating to the sale, gift, distribution or use of alcoholic beverages.

This exclusion applies only if you are in the business of manufacturing, distributing, selling, serving or furnishing alcoholic beverages.

d. Workers' Compensation And Similar Laws

Any obligation of the insured under a workers' compensation, disability benefits or unemployment compensation law or any similar law.

e. Employer's Liability

"Bodily injury" to:

- (1) An "employee" of the insured arising out of and in the course of:
 - (a) Employment by the insured; or
 - (b) Performing duties related to the conduct of the insured's business; or
- (2) The spouse, child, parent, brother or sister of that "employee" as a consequence of Paragraph (1) above.

This exclusion applies:

- (1) Whether the insured may be liable as an employer or in any other capacity; and
- (2) To any obligation to share damages with or repay someone else who must pay damages because of the injury.

This exclusion does not apply to liability assumed by the insured under an "insured contract".

f. Pollution

- (1) "Bodily injury" or "property damage" arising out of the actual, alleged or threatened discharge, dispersal, seepage, migration, release or escape of "pollutants":
- (a) At or from any premises, site or location which is or was at any time owned or occupied by, or rented or loaned to, any insured. However, this subparagraph does not apply to:
 - (i) "Bodily injury" if sustained within a building and caused by smoke, fumes, vapor or soot produced by or originating from equipment that is used to heat, cool or dehumidify the building, or equipment that is used to heat water for personal use, by the building's occupants or their guests;
 - (ii) "Bodily injury" or "property damage" for which you may be held liable, if you are a contractor and the owner or lessee of such premises, site or location has been added to your policy as an additional insured with respect to your ongoing operations performed for that additional insured at that premises, site or location and such premises, site or location is not and never was owned or occupied by, or rented or loaned to, any insured, other than that additional insured; or
 - (iii) "Bodily injury" or "property damage" arising out of heat, smoke or fumes from a "hostile fire";
 - (b) At or from any premises, site or location which is or was at any time used by or for any insured or others for the handling, storage, disposal, processing or treatment of waste;
 - (c) Which are or were at any time transported, handled, stored, treated, disposed of, or processed as waste by or for:
 - (i) Any insured; or
 - (ii) Any person or organization for whom you may be legally responsible; or
 - (d) At or from any premises, site or location on which any insured or any contractors or subcontractors working directly or indirectly on any insured's behalf are performing operations if the "pollutants" are brought on or to the premises, site or location in connection with such operations by such insured, contractor or subcontractor. However, this subparagraph does not apply to:
 - (i) "Bodily injury" or "property damage" arising out of the escape of fuels, lubricants or other operating fluids which are needed to perform the normal electrical, hydraulic or mechanical functions necessary for the operation of "mobile equipment" or its parts, if such fuels, lubricants or other operating fluids escape from a vehicle part designed to hold, store or receive them. This exception does not apply if the "bodily injury" or "property damage" arises out of the intentional discharge, dispersal or release of the fuels, lubricants or other operating fluids, or if such fuels, lubricants or other operating fluids are brought on or to the premises, site or location with the intent that they be discharged, dispersed or released as part of the operations being performed by such insured, contractor or subcontractor;
 - (ii) "Bodily injury" or "property damage" sustained within a building and caused by the release of gases, fumes or vapors from materials brought into that building in connection with operations being performed by you or on your behalf by a contractor or subcontractor; or
 - (iii) "Bodily injury" or "property damage" arising out of heat, smoke or fumes from a "hostile fire".
 - (e) At or from any premises, site or location on which any insured or any contractors or subcontractors working directly or indirectly on any insured's behalf are performing operations if the operations are to test for, monitor, clean up, remove, contain, treat, detoxify or neutralize, or in any way respond to, or assess the effects of, "pollutants".

(2) Any loss, cost or expense arising out of any:

- (a) Request, demand, order or statutory or regulatory requirement that any insured or others test for, monitor, clean up, remove, contain, treat, detoxify or neutralize, or in any way respond to, or assess the effects of, "pollutants"; or
- (b) Claim or "suit" by or on behalf of a governmental authority for damages because of testing for, monitoring, cleaning up, removing, containing, treating, detoxifying or neutralizing, or in any way responding to, or assessing the effects of, "pollutants".

However, this paragraph does not apply to liability for damages because of "property damage" that the insured would have in the absence of such request, demand, order or statutory or regulatory requirement, or such claim or "suit" by or on behalf of a governmental authority.

g. Aircraft, Auto Or Watercraft

"Bodily injury" or "property damage" arising out of the ownership, maintenance, use or entrustment to others of any aircraft, "auto" or watercraft owned or operated by or rented or loaned to any insured. Use includes operation and "loading or unloading".

This exclusion applies even if the claims against any insured allege negligence or other wrongdoing in the supervision, hiring, employment, training or monitoring of others by that insured, if the "occurrence" which caused the "bodily injury" or "property damage" involved the ownership, maintenance, use or entrustment to others of any aircraft, "auto" or watercraft that is owned or operated by or rented or loaned to any insured.

This exclusion does not apply to:

- (1) A watercraft while ashore on premises you own or rent;
- (2) A watercraft you do not own that is:
 - (a) Less than 26 feet long; and
 - (b) Not being used to carry persons or property for a charge;
- (3) Parking an "auto" on, or on the ways next to, premises you own or rent, provided the "auto" is not owned by or rented or loaned to you or the insured;
- (4) Liability assumed under any "insured contract" for the ownership, maintenance or use of aircraft or watercraft; or

(5) "Bodily injury" or "property damage" arising out of:

- (a) The operation of machinery or equipment that is attached to, or part of, a land vehicle that would qualify under the definition of "mobile equipment" if it were not subject to a compulsory or financial responsibility law or other motor vehicle insurance law in the state where it is licensed or principally garaged; or
- (b) the operation of any of the machinery or equipment listed in Paragraph **f.(2)** or **f.(3)** of the definition of "mobile equipment".

h. Mobile Equipment

"Bodily injury" or "property damage" arising out of:

- (1) The transportation of "mobile equipment" by an "auto" owned or operated by or rented or loaned to any insured; or
- (2) The use of "mobile equipment" in, or while in practice for, or while being prepared for, any prearranged racing, speed, demolition, or stunting activity.

i. War

"Bodily injury" or "property damage", however caused, arising, directly or indirectly, out of:

- (1) War, including undeclared or civil war;
- (2) Warlike action by a military force, including action in hindering or defending against an actual or expected attack, by any government, sovereign or other authority using military personnel or other agents; or
- (3) Insurrection, rebellion, revolution, usurped power, or action taken by governmental authority in hindering or defending against any of these.

j. Damage To Property

"Property damage" to:

- (1) Property you own, rent, or occupy, including any costs or expenses incurred by you, or any other person, organization or entity, for repair, replacement, enhancement, restoration or maintenance of such property for any reason, including prevention of injury to a person or damage to another's property;
- (2) Premises you sell, give away or abandon, if the "property damage" arises out of any part of those premises;
- (3) Property loaned to you;
- (4) Personal property in the care, custody or control of the insured;

(5) That particular part of real property on which you or any contractors or subcontractors working directly or indirectly on your behalf are performing operations, if the "property damage" arises out of those operations; or

(6) That particular part of any property that must be restored, repaired or replaced because "your work" was incorrectly performed on it.

Paragraphs (1), (3) and (4) of this exclusion do not apply to "property damage" (other than damage by fire) to premises, including the contents of such premises, rented to you for a period of 7 or fewer consecutive days. A separate limit of insurance applies to Damage To Premises Rented To You as described in Section III – Limits Of Insurance.

Paragraph (2) of this exclusion does not apply if the premises are "your work" and were never occupied, rented or held for rental by you.

Paragraphs (3), (4), (5) and (6) of this exclusion do not apply to liability assumed under a side-track agreement.

Paragraph (6) of this exclusion does not apply to "property damage" included in the "products-completed operations hazard".

k. Damage To Your Product

"Property damage" to "your product" arising out of it or any part of it.

l. Damage To Your Work

"Property damage" to "your work" arising out of it or any part of it and included in the "products-completed operations hazard".

This exclusion does not apply if the damaged work or the work out of which the damage arises was performed on your behalf by a subcontractor.

m. Damage To Impaired Property Or Property Not Physically Injured

"Property damage" to "impaired property" or property that has not been physically injured, arising out of:

- (1) A defect, deficiency, inadequacy or dangerous condition in "your product" or "your work"; or
- (2) A delay or failure by you or anyone acting on your behalf to perform a contract or agreement in accordance with its terms.

This exclusion does not apply to the loss of use of other property arising out of sudden and accidental physical injury to "your product" or "your work" after it has been put to its intended use.

n. Recall Of Products, Work Or Impaired Property

Damages claimed for any loss, cost or expense incurred by you or others for the loss of use, withdrawal, recall, inspection, repair, replacement, adjustment, removal or disposal of:

- (1) "Your product";
- (2) "Your work"; or
- (3) "Impaired property";

if such product, work, or property is withdrawn or recalled from the market or from use by any person or organization because of a known or suspected defect, deficiency, inadequacy or dangerous condition in it.

o. Personal And Advertising Injury

"Bodily injury" arising out of "personal and advertising injury".

p. Electronic Data

Damages arising out of the loss of, loss of use of, damage to, corruption of, inability to access, or inability to manipulate electronic data.

As used in this exclusion, electronic data means information, facts or programs stored as or on, created or used on, or transmitted to or from computer software, including systems and applications software, hard or floppy disks, CD-ROMS, tapes, drives, cells, data processing devices or any other media which are used with electronically controlled equipment.

Exclusions c. through n. do not apply to damage by fire to premises while rented to you or temporarily occupied by you with permission of the owner. A separate limit of insurance applies to this coverage as described in Section III – Limits Of Insurance.

COVERAGE B PERSONAL AND ADVERTISING INJURY LIABILITY

1. Insuring Agreement

a. We will pay those sums that the insured becomes legally obligated to pay as damages because of "personal and advertising injury" to which this insurance applies. We will have the right and duty to defend the insured against any "suit" seeking those damages. However, we will have no duty to defend the insured against any "suit" seeking damages for "personal and advertising injury" to which this insurance does not apply. We may, at our discretion, investigate any offense and settle any claim or "suit" that may result. But:

- (1) The amount we will pay for damages is limited as described in Section III – Limits Of Insurance; and

- (2) Our right and duty to defend end when we have used up the applicable limit of insurance in the payment of judgments or settlements under Coverages **A** or **B** or medical expenses under Coverage **C**.

No other obligation or liability to pay sums or perform acts or services is covered unless explicitly provided for under Supplementary Payments – Coverages **A** and **B**.

- b. This insurance applies to "personal and advertising injury" caused by an offense arising out of your business but only if the offense was committed in the "coverage territory" during the policy period.

2. Exclusions

This insurance does not apply to:

a. Knowing Violation Of Rights Of Another

"Personal and advertising injury" caused by or at the direction of the insured with the knowledge that the act would violate the rights of another and would inflict "personal and advertising injury".

b. Material Published With Knowledge Of Falsity

"Personal and advertising injury" arising out of oral or written publication of material, if done by or at the direction of the insured with knowledge of its falsity.

c. Material Published Prior To Policy Period

"Personal and advertising injury" arising out of oral or written publication of material whose first publication took place before the beginning of the policy period.

d. Criminal Acts

"Personal and advertising injury" arising out of a criminal act committed by or at the direction of the insured.

e. Contractual Liability

"Personal and advertising injury" for which the insured has assumed liability in a contract or agreement. This exclusion does not apply to liability for damages that the insured would have in the absence of the contract or agreement.

f. Breach Of Contract

"Personal and advertising injury" arising out of a breach of contract, except an implied contract to use another's advertising idea in your "advertisement".

g. Quality Or Performance Of Goods – Failure To Conform To Statements

"Personal and advertising injury" arising out of the failure of goods, products or services to conform with any statement of quality or performance made in your "advertisement".

h. Wrong Description Of Prices

"Personal and advertising injury" arising out of the wrong description of the price of goods, products or services stated in your "advertisement".

i. Infringement Of Copyright, Patent, Trademark Or Trade Secret

"Personal and advertising injury" arising out of the infringement of copyright, patent, trademark, trade secret or other intellectual property rights.

However, this exclusion does not apply to infringement, in your "advertisement", of copyright, trade dress or slogan.

j. Insureds In Media And Internet Type Businesses

"Personal and advertising injury" committed by an insured whose business is:

- (1) Advertising, broadcasting, publishing or telecasting;
- (2) Designing or determining content of websites for others; or
- (3) An Internet search, access, content or service provider.

However, this exclusion does not apply to Paragraphs **14.a.**, **b.** and **c.** of "personal and advertising injury" under the Definitions Section.

For the purposes of this exclusion, the placing of frames, borders or links, or advertising, for you or others anywhere on the Internet, is not by itself, considered the business of advertising, broadcasting, publishing or telecasting.

k. Electronic Chatrooms Or Bulletin Boards

"Personal and advertising injury" arising out of an electronic chatroom or bulletin board the insured hosts, owns, or over which the insured exercises control.

l. Unauthorized Use Of Another's Name Or Product

"Personal and advertising injury" arising out of the unauthorized use of another's name or product in your e-mail address, domain name or metatag, or any other similar tactics to mislead another's potential customers.

m. Pollution

"Personal and advertising injury" arising out of the actual, alleged or threatened discharge, dispersal, seepage, migration, release or escape of "pollutants" at any time.

n. Pollution-Related

Any loss, cost or expense arising out of any:

- (1) Request, demand, order or statutory or regulatory requirement that any insured or others test for, monitor, clean up, remove, contain, treat, detoxify or neutralize, or in any way respond to, or assess the effects of, "pollutants"; or
- (2) Claim or suit by or on behalf of a governmental authority for damages because of testing for, monitoring, cleaning up, removing, containing, treating, detoxifying or neutralizing, or in any way responding to, or assessing the effects of, "pollutants".

o. War

"Personal and advertising injury", however caused, arising, directly or indirectly, out of:

- (1) War, including undeclared or civil war;
- (2) Warlike action by a military force, including action in hindering or defending against an actual or expected attack, by any government, sovereign or other authority using military personnel or other agents; or
- (3) Insurrection, rebellion, revolution, usurped power, or action taken by governmental authority in hindering or defending against any of these.

COVERAGE C MEDICAL PAYMENTS

1. Insuring Agreement

- a. We will pay medical expenses as described below for "bodily injury" caused by an accident:

- (1) On premises you own or rent;
- (2) On ways next to premises you own or rent; or
- (3) Because of your operations; provided that:
 - (1) The accident takes place in the "coverage territory" and during the policy period;
 - (2) The expenses are incurred and reported to us within one year of the date of the accident; and
 - (3) The injured person submits to examination, at our expense, by physicians of our choice as often as we reasonably require.

- b. We will make these payments regardless of fault. These payments will not exceed the applicable limit of insurance. We will pay reasonable expenses for:

- (1) First aid administered at the time of an accident;
- (2) Necessary medical, surgical, x-ray and dental services, including prosthetic devices; and
- (3) Necessary ambulance, hospital, professional nursing and funeral services.

2. Exclusions

We will not pay expenses for "bodily injury":

a. Any Insured

To any insured, except "volunteer workers".

b. Hired Person

To a person hired to do work for or on behalf of any insured or a tenant of any insured.

c. Injury On Normally Occupied Premises

To a person injured on that part of premises you own or rent that the person normally occupies.

d. Workers Compensation And Similar Laws

To a person, whether or not an "employee" of any insured, if benefits for the "bodily injury" are payable or must be provided under a workers' compensation or disability benefits law or a similar law.

e. Athletics Activities

To a person injured while practicing, instructing or participating in any physical exercises or games, sports, or athletic contests.

f. Products-Completed Operations Hazard

Included within the "products-completed operations hazard".

g. Coverage A Exclusions

Excluded under Coverage A.

SUPPLEMENTARY PAYMENTS – COVERAGES A AND B

1. We will pay, with respect to any claim we investigate or settle, or any "suit" against an insured we defend:

- a. All expenses we incur.
- b. Up to \$250 for cost of bail bonds required because of accidents or traffic law violations arising out of the use of any vehicle to which the Bodily Injury Liability Coverage applies. We do not have to furnish these bonds.

- c. The cost of bonds to release attachments, but only for bond amounts within the applicable limit of insurance. We do not have to furnish these bonds.
- d. All reasonable expenses incurred by the insured at our request to assist us in the investigation or defense of the claim or "suit", including actual loss of earnings up to \$250 a day because of time off from work.
- e. All costs taxed against the insured in the "suit".
- f. Prejudgment interest awarded against the insured on that part of the judgment we pay. If we make an offer to pay the applicable limit of insurance, we will not pay any prejudgment interest based on that period of time after the offer.
- g. All interest on the full amount of any judgment that accrues after entry of the judgment and before we have paid, offered to pay, or deposited in court the part of the judgment that is within the applicable limit of insurance.

These payments will not reduce the limits of insurance.

- 2. If we defend an insured against a "suit" and an indemnitee of the insured is also named as a party to the "suit", we will defend that indemnitee if all of the following conditions are met:
 - a. The "suit" against the indemnitee seeks damages for which the insured has assumed the liability of the indemnitee in a contract or agreement that is an "insured contract";
 - b. This insurance applies to such liability assumed by the insured;
 - c. The obligation to defend, or the cost of the defense of, that indemnitee, has also been assumed by the insured in the same "insured contract";
 - d. The allegations in the "suit" and the information we know about the "occurrence" are such that no conflict appears to exist between the interests of the insured and the interests of the indemnitee;
 - e. The indemnitee and the insured ask us to conduct and control the defense of that indemnitee against such "suit" and agree that we can assign the same counsel to defend the insured and the indemnitee; and
 - f. The indemnitee:
 - (1) Agrees in writing to:
 - (a) Cooperate with us in the investigation, settlement or defense of the "suit";

- (b) Immediately send us copies of any demands, notices, summonses or legal papers received in connection with the "suit";
 - (c) Notify any other insurer whose coverage is available to the indemnitee; and
 - (d) Cooperate with us with respect to coordinating other applicable insurance available to the indemnitee; and
- (2) Provides us with written authorization to:
 - (a) Obtain records and other information related to the "suit"; and
 - (b) Conduct and control the defense of the indemnitee in such "suit".

So long as the above conditions are met, attorneys' fees incurred by us in the defense of that indemnitee, necessary litigation expenses incurred by us and necessary litigation expenses incurred by the indemnitee at our request will be paid as Supplementary Payments. Notwithstanding the provisions of Paragraph **2.b.(2)** of Section **I – Coverage A – Bodily Injury And Property Damage Liability**, such payments will not be deemed to be damages for "bodily injury" and "property damage" and will not reduce the limits of insurance.

Our obligation to defend an insured's indemnitee and to pay for attorneys' fees and necessary litigation expenses as Supplementary Payments ends when:

- a. We have used up the applicable limit of insurance in the payment of judgments or settlements; or
- b. The conditions set forth above, or the terms of the agreement described in Paragraph **f.** above, are no longer met.

SECTION II – WHO IS AN INSURED

- 1. If you are designated in the Declarations as:
 - a. An individual, you and your spouse are insureds, but only with respect to the conduct of a business of which you are the sole owner.
 - b. A partnership or joint venture, you are an insured. Your members, your partners, and their spouses are also insureds, but only with respect to the conduct of your business.
 - c. A limited liability company, you are an insured. Your members are also insureds, but only with respect to the conduct of your business. Your managers are insureds, but only with respect to their duties as your managers.

- d. An organization other than a partnership, joint venture or limited liability company, you are an insured. Your "executive officers" and directors are insureds, but only with respect to their duties as your officers or directors. Your stockholders are also insureds, but only with respect to their liability as stockholders.
 - e. A trust, you are an insured. Your trustees are also insureds, but only with respect to their duties as trustees.
2. Each of the following is also an insured:
- a. Your "volunteer workers" only while performing duties related to the conduct of your business, or your "employees", other than either your "executive officers" (if you are an organization other than a partnership, joint venture or limited liability company) or your managers (if you are a limited liability company), but only for acts within the scope of their employment by you or while performing duties related to the conduct of your business. However, none of these "employees" or "volunteer workers" are insureds for:
 - (1) "Bodily injury" or "personal and advertising injury":
 - (a) To you, to your partners or members (if you are a partnership or joint venture), to your members (if you are a limited liability company), to a co-"employee" while in the course of his or her employment or performing duties related to the conduct of your business, or to your other "volunteer workers" while performing duties related to the conduct of your business;
 - (b) To the spouse, child, parent, brother or sister of that co-"employee" or "volunteer worker" as a consequence of Paragraph (1)(a) above;
 - (c) For which there is any obligation to share damages with or repay someone else who must pay damages because of the injury described in Paragraphs (1)(a) or (b) above; or
 - (d) Arising out of his or her providing or failing to provide professional health care services.
 - (2) "Property damage" to property:
 - (a) Owned, occupied or used by,
 - (b) Rented to, in the care, custody or control of, or over which physical control is being exercised for any purpose by you, any of your "employees", "volunteer workers", any partner or member (if you are a partnership or joint venture), or any member (if you are a limited liability company).
 - b. Any person (other than your "employee" or "volunteer worker"), or any organization while acting as your real estate manager.
 - c. Any person or organization having proper temporary custody of your property if you die, but only:
 - (1) With respect to liability arising out of the maintenance or use of that property; and
 - (2) Until your legal representative has been appointed.
 - d. Your legal representative if you die, but only with respect to duties as such. That representative will have all your rights and duties under this Coverage Part.
3. Any organization you newly acquire or form, other than a partnership, joint venture or limited liability company, and over which you maintain ownership or majority interest, will qualify as a Named Insured if there is no other similar insurance available to that organization. However:
- a. Coverage under this provision is afforded only until the 90th day after you acquire or form the organization or the end of the policy period, whichever is earlier;
 - b. Coverage A does not apply to "bodily injury" or "property damage" that occurred before you acquired or formed the organization; and
 - c. Coverage B does not apply to "personal and advertising injury" arising out of an offense committed before you acquired or formed the organization.
- No person or organization is an insured with respect to the conduct of any current or past partnership, joint venture or limited liability company that is not shown as a Named Insured in the Declarations.

SECTION III – LIMITS OF INSURANCE

- 1. The Limits of Insurance shown in the Declarations and the rules below fix the most we will pay regardless of the number of:
 - a. Insureds;
 - b. Claims made or "suits" brought; or
 - c. Persons or organizations making claims or bringing "suits".

2. The General Aggregate Limit is the most we will pay for the sum of:
 - a. Medical expenses under Coverage C;
 - b. Damages under Coverage A, except damages because of "bodily injury" or "property damage" included in the "products-completed operations hazard"; and
 - c. Damages under Coverage B.
3. The Products-Completed Operations Aggregate Limit is the most we will pay under Coverage A for damages because of "bodily injury" and "property damage" included in the "products-completed operations hazard".
4. Subject to 2. above, the Personal and Advertising Injury Limit is the most we will pay under Coverage B for the sum of all damages because of all "personal and advertising injury" sustained by any one person or organization.
5. Subject to 2. or 3. above, whichever applies, the Each Occurrence Limit is the most we will pay for the sum of:
 - a. Damages under Coverage A; and
 - b. Medical expenses under Coverage C because of all "bodily injury" and "property damage" arising out of any one "occurrence".
6. Subject to 5. above, the Damage To Premises Rented To You Limit is the most we will pay under Coverage A for damages because of "property damage" to any one premises, while rented to you, or in the case of damage by fire, while rented to you or temporarily occupied by you with permission of the owner.
7. Subject to 5. above, the Medical Expense Limit is the most we will pay under Coverage C for all medical expenses because of "bodily injury" sustained by any one person.

The Limits of Insurance of this Coverage Part apply separately to each consecutive annual period and to any remaining period of less than 12 months, starting with the beginning of the policy period shown in the Declarations, unless the policy period is extended after issuance for an additional period of less than 12 months. In that case, the additional period will be deemed part of the last preceding period for purposes of determining the Limits of Insurance.

SECTION IV – COMMERCIAL GENERAL LIABILITY CONDITIONS

1. Bankruptcy

Bankruptcy or insolvency of the insured or of the insured's estate will not relieve us of our obligations under this Coverage Part.

2. Duties In The Event Of Occurrence, Offense, Claim Or Suit

- a. You must see to it that we are notified as soon as practicable of an "occurrence" or an offense which may result in a claim. To the extent possible, notice should include:
 - (1) How, when and where the "occurrence" or offense took place;
 - (2) The names and addresses of any injured persons and witnesses; and
 - (3) The nature and location of any injury or damage arising out of the "occurrence" or offense.
- b. If a claim is made or "suit" is brought against any insured, you must:
 - (1) Immediately record the specifics of the claim or "suit" and the date received; and
 - (2) Notify us as soon as practicable.

You must see to it that we receive written notice of the claim or "suit" as soon as practicable.
- c. You and any other involved insured must:
 - (1) Immediately send us copies of any demands, notices, summonses or legal papers received in connection with the claim or "suit";
 - (2) Authorize us to obtain records and other information;
 - (3) Cooperate with us in the investigation or settlement of the claim or defense against the "suit"; and
 - (4) Assist us, upon our request, in the enforcement of any right against any person or organization which may be liable to the insured because of injury or damage to which this insurance may also apply.
- d. No insured will, except at that insured's own cost, voluntarily make a payment, assume any obligation, or incur any expense, other than for first aid, without our consent.

3. Legal Action Against Us

No person or organization has a right under this Coverage Part:

- a. To join us as a party or otherwise bring us into a "suit" asking for damages from an insured; or

- b.** To sue us on this Coverage Part unless all of its terms have been fully complied with.

A person or organization may sue us to recover on an agreed settlement or on a final judgment against an insured; but we will not be liable for damages that are not payable under the terms of this Coverage Part or that are in excess of the applicable limit of insurance. An agreed settlement means a settlement and release of liability signed by us, the insured and the claimant or the claimant's legal representative.

4. Other Insurance

If other valid and collectible insurance is available to the insured for a loss we cover under Coverages **A** or **B** of this Coverage Part, our obligations are limited as follows:

a. Primary Insurance

This insurance is primary except when **b.** below applies. If this insurance is primary, our obligations are not affected unless any of the other insurance is also primary. Then, we will share with all that other insurance by the method described in **c.** below.

b. Excess Insurance

This insurance is excess over:

- (1)** Any of the other insurance, whether primary, excess, contingent or on any other basis:
 - (a)** That is Fire, Extended Coverage, Builder's Risk, Installation Risk or similar coverage for "your work";
 - (b)** That is Fire insurance for premises rented to you or temporarily occupied by you with permission of the owner;
 - (c)** That is insurance purchased by you to cover your liability as a tenant for "property damage" to premises rented to you or temporarily occupied by you with permission of the owner; or
 - (d)** If the loss arises out of the maintenance or use of aircraft, "autos" or watercraft to the extent not subject to Exclusion **g.** of Section **I** – Coverage **A** – Bodily Injury And Property Damage Liability.
- (2)** Any other primary insurance available to you covering liability for damages arising out of the premises or operations, or the products and completed operations, for which you have been added as an additional insured by attachment of an endorsement.

When this insurance is excess, we will have no duty under Coverages **A** or **B** to defend the insured against any "suit" if any other insurer has a duty to defend the insured against that "suit". If no other insurer defends, we will undertake to do so, but we will be entitled to the insured's rights against all those other insurers.

When this insurance is excess over other insurance, we will pay only our share of the amount of the loss, if any, that exceeds the sum of:

- (1)** The total amount that all such other insurance would pay for the loss in the absence of this insurance; and
- (2)** The total of all deductible and self-insured amounts under all that other insurance.

We will share the remaining loss, if any, with any other insurance that is not described in this Excess Insurance provision and was not bought specifically to apply in excess of the Limits of Insurance shown in the Declarations of this Coverage Part.

c. Method Of Sharing

If all of the other insurance permits contribution by equal shares, we will follow this method also. Under this approach each insurer contributes equal amounts until it has paid its applicable limit of insurance or none of the loss remains, whichever comes first.

If any of the other insurance does not permit contribution by equal shares, we will contribute by limits. Under this method, each insurer's share is based on the ratio of its applicable limit of insurance to the total applicable limits of insurance of all insurers.

5. Premium Audit

- a.** We will compute all premiums for this Coverage Part in accordance with our rules and rates.
- b.** Premium shown in this Coverage Part as advance premium is a deposit premium only. At the close of each audit period we will compute the earned premium for that period and send notice to the first Named Insured. The due date for audit and retrospective premiums is the date shown as the due date on the bill. If the sum of the advance and audit premiums paid for the policy period is greater than the earned premium, we will return the excess to the first Named Insured.
- c.** The first Named Insured must keep records of the information we need for premium computation, and send us copies at such times as we may request.

6. Representations

By accepting this policy, you agree:

- a. The statements in the Declarations are accurate and complete;
- b. Those statements are based upon representations you made to us; and
- c. We have issued this policy in reliance upon your representations.

7. Separation Of Insureds

Except with respect to the Limits of Insurance, and any rights or duties specifically assigned in this Coverage Part to the first Named Insured, this insurance applies:

- a. As if each Named Insured were the only Named Insured; and
- b. Separately to each insured against whom claim is made or "suit" is brought.

8. Transfer Of Rights Of Recovery Against Others To Us

If the insured has rights to recover all or part of any payment we have made under this Coverage Part, those rights are transferred to us. The insured must do nothing after loss to impair them. At our request, the insured will bring "suit" or transfer those rights to us and help us enforce them.

9. When We Do Not Renew

If we decide not to renew this Coverage Part, we will mail or deliver to the first Named Insured shown in the Declarations written notice of the non-renewal not less than 30 days before the expiration date.

If notice is mailed, proof of mailing will be sufficient proof of notice.

SECTION V – DEFINITIONS

1. "Advertisement" means a notice that is broadcast or published to the general public or specific market segments about your goods, products or services for the purpose of attracting customers or supporters. For the purposes of this definition:
 - a. Notices that are published include material placed on the Internet or on similar electronic means of communication; and
 - b. Regarding web-sites, only that part of a web-site that is about your goods, products or services for the purposes of attracting customers or supporters is considered an advertisement.
2. "Auto" means:
 - a. A land motor vehicle, trailer or semitrailer designed for travel on public roads, including any attached machinery or equipment; or

- b. Any other land vehicle that is subject to a compulsory or financial responsibility law or other motor vehicle insurance law in the state where it is licensed or principally garaged.

However, "auto" does not include "mobile equipment".

3. "Bodily injury" means bodily injury, sickness or disease sustained by a person, including death resulting from any of these at any time.

4. "Coverage territory" means:

- a. The United States of America (including its territories and possessions), Puerto Rico and Canada;
- b. International waters or airspace, but only if the injury or damage occurs in the course of travel or transportation between any places included in a. above; or
- c. All other parts of the world if the injury or damage arises out of:
 - (1) Goods or products made or sold by you in the territory described in a. above;
 - (2) The activities of a person whose home is in the territory described in a. above, but is away for a short time on your business; or
 - (3) "Personal and advertising injury" offenses that take place through the Internet or similar electronic means of communication

provided the insured's responsibility to pay damages is determined in a "suit" on the merits, in the territory described in a. above or in a settlement we agree to.

5. "Employee" includes a "leased worker". "Employee" does not include a "temporary worker".
6. "Executive officer" means a person holding any of the officer positions created by your charter, constitution, by-laws or any other similar governing document.
7. "Hostile fire" means one which becomes uncontrollable or breaks out from where it was intended to be.
8. "Impaired property" means tangible property, other than "your product" or "your work", that cannot be used or is less useful because:

- a. It incorporates "your product" or "your work" that is known or thought to be defective, deficient, inadequate or dangerous; or
- b. You have failed to fulfill the terms of a contract or agreement;

if such property can be restored to use by:

- a. The repair, replacement, adjustment or removal of "your product" or "your work"; or

- b. Your fulfilling the terms of the contract or agreement.

9. "Insured contract" means:

- a. A contract for a lease of premises. However, that portion of the contract for a lease of premises that indemnifies any person or organization for damage by fire to premises while rented to you or temporarily occupied by you with permission of the owner is not an "insured contract";
- b. A sidetrack agreement;
- c. Any easement or license agreement, except in connection with construction or demolition operations on or within 50 feet of a railroad;
- d. An obligation, as required by ordinance, to indemnify a municipality, except in connection with work for a municipality;
- e. An elevator maintenance agreement;
- f. That part of any other contract or agreement pertaining to your business (including an indemnification of a municipality in connection with work performed for a municipality) under which you assume the tort liability of another party to pay for "bodily injury" or "property damage" to a third person or organization. Tort liability means a liability that would be imposed by law in the absence of any contract or agreement.

Paragraph f. does not include that part of any contract or agreement:

- (1) That indemnifies a railroad for "bodily injury" or "property damage" arising out of construction or demolition operations, within 50 feet of any railroad property and affecting any railroad bridge or trestle, tracks, roadbeds, tunnel, underpass or crossing;
- (2) That indemnifies an architect, engineer or surveyor for injury or damage arising out of:
 - (a) Preparing, approving, or failing to prepare or approve, maps, shop drawings, opinions, reports, surveys, field orders, change orders or drawings and specifications; or
 - (b) Giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage; or
- (3) Under which the insured, if an architect, engineer or surveyor, assumes liability for an injury or damage arising out of the insured's rendering or failure to render professional services, including those listed in (2) above and supervisory, inspection, architectural or engineering activities.

10. "Leased worker" means a person leased to you by a labor leasing firm under an agreement between you and the labor leasing firm, to perform duties related to the conduct of your business. "Leased worker" does not include a "temporary worker".

11. "Loading or unloading" means the handling of property:

- a. After it is moved from the place where it is accepted for movement into or onto an aircraft, watercraft or "auto";
- b. While it is in or on an aircraft, watercraft or "auto"; or
- c. While it is being moved from an aircraft, watercraft or "auto" to the place where it is finally delivered;

but "loading or unloading" does not include the movement of property by means of a mechanical device, other than a hand truck, that is not attached to the aircraft, watercraft or "auto".

12. "Mobile equipment" means any of the following types of land vehicles, including any attached machinery or equipment:

- a. Bulldozers, farm machinery, forklifts and other vehicles designed for use principally off public roads;
- b. Vehicles maintained for use solely on or next to premises you own or rent;
- c. Vehicles that travel on crawler treads;
- d. Vehicles, whether self-propelled or not, maintained primarily to provide mobility to permanently mounted:
 - (1) Power cranes, shovels, loaders, diggers or drills; or
 - (2) Road construction or resurfacing equipment such as graders, scrapers or rollers;
- e. Vehicles not described in a., b., c. or d. above that are not self-propelled and are maintained primarily to provide mobility to permanently attached equipment of the following types:
 - (1) Air compressors, pumps and generators, including spraying, welding, building cleaning, geophysical exploration, lighting and well servicing equipment; or
 - (2) Cherry pickers and similar devices used to raise or lower workers;
- f. Vehicles not described in a., b., c. or d. above maintained primarily for purposes other than the transportation of persons or cargo.

However, self-propelled vehicles with the following types of permanently attached equipment are not "mobile equipment" but will be considered "autos":

- (1) Equipment designed primarily for:
 - (a) Snow removal;
 - (b) Road maintenance, but not construction or resurfacing; or
 - (c) Street cleaning;
- (2) Cherry pickers and similar devices mounted on automobile or truck chassis and used to raise or lower workers; and
- (3) Air compressors, pumps and generators, including spraying, welding, building cleaning, geophysical exploration, lighting and well servicing equipment.

However, "mobile equipment" does not include any land vehicles that are subject to a compulsory or financial responsibility law or other motor vehicle insurance law in the state where it is licensed or principally garaged. Land vehicles subject to a compulsory or financial responsibility law or other motor vehicle insurance law are considered "autos".

13. "Occurrence" means an accident, including continuous or repeated exposure to substantially the same general harmful conditions.
14. "Personal and advertising injury" means injury, including consequential "bodily injury", arising out of one or more of the following offenses:
 - a. False arrest, detention or imprisonment;
 - b. Malicious prosecution;
 - c. The wrongful eviction from, wrongful entry into, or invasion of the right of private occupancy of a room, dwelling or premises that a person occupies, committed by or on behalf of its owner, landlord or lessor;
 - d. Oral or written publication, in any manner, of material that slanders or libels a person or organization or disparages a person's or organization's goods, products or services;
 - e. Oral or written publication, in any manner, of material that violates a person's right of privacy;
 - f. The use of another's advertising idea in your "advertisement"; or
 - g. Infringing upon another's copyright, trade dress or slogan in your "advertisement".
15. "Pollutants" mean any solid, liquid, gaseous or thermal irritant or contaminant, including smoke, vapor, soot, fumes, acids, alkalis, chemicals and waste. Waste includes materials to be recycled, reconditioned or reclaimed.

16. "Products-completed operations hazard":

- a. Includes all "bodily injury" and "property damage" occurring away from premises you own or rent and arising out of "your product" or "your work" except:

- (1) Products that are still in your physical possession; or
- (2) Work that has not yet been completed or abandoned. However, "your work" will be deemed completed at the earliest of the following times:
 - (a) When all of the work called for in your contract has been completed.
 - (b) When all of the work to be done at the job site has been completed if your contract calls for work at more than one job site.
 - (c) When that part of the work done at a job site has been put to its intended use by any person or organization other than another contractor or subcontractor working on the same project.

Work that may need service, maintenance, correction, repair or replacement, but which is otherwise complete, will be treated as completed.

- b. Does not include "bodily injury" or "property damage" arising out of:
 - (1) The transportation of property, unless the injury or damage arises out of a condition in or on a vehicle not owned or operated by you, and that condition was created by the "loading or unloading" of that vehicle by any insured;
 - (2) The existence of tools, uninstalled equipment or abandoned or unused materials; or
 - (3) Products or operations for which the classification, listed in the Declarations or in a policy schedule, states that products-completed operations are subject to the General Aggregate Limit.

17. "Property damage" means:

- a. Physical injury to tangible property, including all resulting loss of use of that property. All such loss of use shall be deemed to occur at the time of the physical injury that caused it; or

- b.** Loss of use of tangible property that is not physically injured. All such loss of use shall be deemed to occur at the time of the "occurrence" that caused it.

For the purposes of this insurance, electronic data is not tangible property.

As used in this definition, electronic data means information, facts or programs stored as or on, created or used on, or transmitted to or from computer software, including systems and applications software, hard or floppy disks, CD-ROMS, tapes, drives, cells, data processing devices or any other media which are used with electronically controlled equipment.

18. "Suit" means a civil proceeding in which damages because of "bodily injury", "property damage" or "personal and advertising injury" to which this insurance applies are alleged. "Suit" includes:

- a.** An arbitration proceeding in which such damages are claimed and to which the insured must submit or does submit with our consent; or
- b.** Any other alternative dispute resolution proceeding in which such damages are claimed and to which the insured submits with our consent.

19. "Temporary worker" means a person who is furnished to you to substitute for a permanent "employee" on leave or to meet seasonal or short-term workload conditions.

20. "Volunteer worker" means a person who is not your "employee", and who donates his or her work and acts at the direction of and within the scope of duties determined by you, and is not paid a fee, salary or other compensation by you or anyone else for their work performed for you.

21. "Your product":

a. Means:

- (1)** Any goods or products, other than real property, manufactured, sold, handled, distributed or disposed of by:
 - (a)** You;
 - (b)** Others trading under your name; or
 - (c)** A person or organization whose business or assets you have acquired; and
- (2)** Containers (other than vehicles), materials, parts or equipment furnished in connection with such goods or products.

b. Includes

- (1)** Warranties or representations made at any time with respect to the fitness, quality, durability, performance or use of "your product"; and
- (2)** The providing of or failure to provide warnings or instructions.

c. Does not include vending machines or other property rented to or located for the use of others but not sold.

22. "Your work":

a. Means:

- (1)** Work or operations performed by you or on your behalf; and
- (2)** Materials, parts or equipment furnished in connection with such work or operations.

b. Includes

- (1)** Warranties or representations made at any time with respect to the fitness, quality, durability, performance or use of "your work", and
- (2)** The providing of or failure to provide warnings or instructions.

POLICY NUMBER:

COMMERCIAL GENERAL LIABILITY
CG 20 10 07 04

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

**ADDITIONAL INSURED – OWNERS, LESSEES OR
CONTRACTORS – SCHEDULED PERSON OR
ORGANIZATION**

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

Name Of Additional Insured Person(s) Or Organization(s):	Location(s) Of Covered Operations
Information required to complete this Schedule, if not shown above, will be shown in the Declarations.	

A. Section II – Who Is An Insured is amended to include as an additional insured the person(s) or organization(s) shown in the Schedule, but only with respect to liability for "bodily injury", "property damage" or "personal and advertising injury" caused, in whole or in part, by:

1. Your acts or omissions; or
2. The acts or omissions of those acting on your behalf;

in the performance of your ongoing operations for the additional insured(s) at the location(s) designated above.

B. With respect to the insurance afforded to these additional insureds, the following additional exclusions apply:

This insurance does not apply to "bodily injury" or "property damage" occurring after:

1. All work, including materials, parts or equipment furnished in connection with such work, on the project (other than service, maintenance or repairs) to be performed by or on behalf of the additional insured(s) at the location of the covered operations has been completed; or
2. That portion of "your work" out of which the injury or damage arises has been put to its intended use by any person or organization other than another contractor or subcontractor engaged in performing operations for a principal as a part of the same project.

END OF SECTION 00 62 16.12

POLICY NUMBER:

COMMERCIAL GENERAL LIABILITY
CG 20 37 07 04**THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.****ADDITIONAL INSURED – OWNERS, LESSEES OR
CONTRACTORS – COMPLETED OPERATIONS**

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

Name Of Additional Insured Person(s) Or Organization(s):	Location And Description Of Completed Operations
Information required to complete this Schedule, if not shown above, will be shown in the Declarations.	

Section II – Who Is An Insured is amended to include as an additional insured the person(s) or organization(s) shown in the Schedule, but only with respect to liability for "bodily injury" or "property damage" caused, in whole or in part, by "your work" at the location designated and described in the schedule of this endorsement performed for that additional insured and included in the "products-completed operations hazard".

END OF SECTION 00 62 16.13

POLICY NUMBER:

COMMERCIAL GENERAL LIABILITY
CG 25 04 03 97**THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.****DESIGNATED LOCATION(S)
GENERAL AGGREGATE LIMIT**

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE**Designated Location(s):**

(If no entry appears above, information required to complete this endorsement will be shown in the Declarations as applicable to this endorsement.)

- A.** For all sums which the insured becomes legally obligated to pay as damages caused by "occurrences" under **COVERAGE A (SECTION I)**, and for all medical expenses caused by accidents under **COVERAGE C (SECTION I)**, which can be attributed only to operations at a single designated "location" shown in the Schedule above:
1. A separate Designated Location General Aggregate Limit applies to each designated "location", and that limit is equal to the amount of the General Aggregate Limit shown in the Declarations.
 2. The Designated Location General Aggregate Limit is the most we will pay for the sum of all damages under **COVERAGE A**, except damages because of "bodily injury" or "property damage" included in the "products-completed operations hazard", and for medical expenses under **COVERAGE C** regardless of the number of:
 - a. Insureds;
 - b. Claims made or "suits" brought; or
 - c. Persons or organizations making claims or bringing "suits".
 3. Any payments made under **COVERAGE A** for damages or under **COVERAGE C** for medical expenses shall reduce the Designated Location General Aggregate Limit for that designated "location". Such payments shall not reduce the General Aggregate Limit shown in the Declarations nor shall they reduce any other Designated Location General Aggregate Limit for any other designated "location" shown in the Schedule above.
 4. The limits shown in the Declarations for Each Occurrence, Fire Damage and Medical Expense continue to apply. However, instead of being subject to the General Aggregate Limit shown in the Declarations, such limits will be subject to the applicable Designated Location General Aggregate Limit.

B. For all sums which the insured becomes legally obligated to pay as damages caused by "occurrences" under **COVERAGE A (SECTION I)**, and for all medical expenses caused by accidents under **COVERAGE C (SECTION I)**, which cannot be attributed only to operations at a single designated "location" shown in the Schedule above:

- 1.** Any payments made under **COVERAGE A** for damages or under **COVERAGE C** for medical expenses shall reduce the amount available under the General Aggregate Limit or the Products-Completed Operations Aggregate Limit, whichever is applicable; and
- 2.** Such payments shall not reduce any Designated Location General Aggregate Limit.

C. When coverage for liability arising out of the "products-completed operations hazard" is provided, any payments for damages because of "bodily injury" or "property damage" included in the "products-completed operations hazard" will reduce the Products-Completed Operations Aggregate Limit, and not reduce the General Aggregate Limit nor the Designated Location General Aggregate Limit.

D. For the purposes of this endorsement, the **Definitions** Section is amended by the addition of the following definition:

"Location" means premises involving the same or connecting lots, or premises whose connection is interrupted only by a street, roadway, waterway or right-of-way of a railroad.

E. The provisions of Limits Of Insurance (**SECTION III**) not otherwise modified by this endorsement shall continue to apply as stipulated.

Sample

END OF SECTION 00 62 16.14



AIA Document G702®, Application and Certificate for Payment, or G732™, Application and Certificate for Payment, Construction Manager as Adviser Edition, containing Contractor's signed certification is attached.

Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO:	001
APPLICATION DATE:	
PERIOD TO:	
ARCHITECT'S PROJECT NO:	

Application and Certificate for Payment

TO OWNER: University of Maine System
by and through
University of Maine
5765 Service Building
Orono, ME 04469

PROJECT:

FROM CONTRACTOR:

VIA ARCHITECT:

APPLICATION NO:
PERIOD TO:

CONTRACT FOR:
CONTRACT DATE:
PROJECT NOS: / /

Distribution to:
OWNER: ☐
ARCHITECT: ☐
CONTRACTOR: ☐
FIELD: ☐
OTHER: ☐

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract.
AIA Document G703®, Continuation Sheet, is attached.

1. ORIGINAL CONTRACT SUM 0.00

2. NET CHANGE BY CHANGE ORDERS 0.00

3. CONTRACT SUM TO DATE (Line 1 ± 2) 0.00

4. TOTAL COMPLETED & STORED TO DATE (Column G on G703) 0.00

5. RETAINAGE:

a. 0 % of Completed Work
(Column D + E on G703) 0.00

b. 0 % of Stored Material
(Column F on G703) 0.00

Total Retainage (Lines 5a + 5b or Total in Column I of G703) 0.00

6. TOTAL EARNED LESS RETAINAGE 0.00
(Line 4 Less Line 5 Total)

7. LESS PREVIOUS CERTIFICATES FOR PAYMENT 0.00
(Line 6 from prior Certificate)

8. CURRENT PAYMENT DUE 0.00

9. BALANCE TO FINISH, INCLUDING RETAINAGE 0.00
(Line 3 less Line 6)

CHANGE ORDER SUMMARY	ADDITIONS	DEDUCTIONS
Total changes approved in previous months by Owner	0.00	0.00
Total approved this Month	0.00	0.00
TOTALS	0.00	0.00
NET CHANGES by Change Order		0.00

The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:

By: _____ Date: _____

State of: _____

County of: _____

Subscribed and sworn to before
me this _____ day of _____

Notary Public: _____

My Commission expires: _____

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED 0.00

(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:

By: _____ Date: _____

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

SECTION 00 62 76.13

SAMPLE

SALES TAX FORM

DATE: _____

VENDOR: _____

Vendor Name

Vendor Address

Vendor City, State Zip

I hereby certify under penalties of perjury, that:

I am engaged in the performance of a construction contract on a project for the University of Maine System which is a Sales Tax exempt organization under the Maine Sales and Use Tax Law, Section 1760, subsection 2 and 16:

This project is titled: UM Demeritt Forest Sawmill
Project Title

The project is located at: UNIVERSITY OF MAINE
Campus Name or Town

This certificate is issued to cover purchases of materials that will be permanently incorporated into the real property belonging to the exempt organization or government agency indicated above.

Signed: _____
Authorized Signature

Name & Title: _____

Firm Name: _____

Firm Address: _____

Firm City, State Zip _____

END OF SECTION 00 62 76.13



AIA[®] Document G707A[™] – 1994

Consent of Surety to Reduction in or Partial Release of Retainage

PROJECT: <i>(Name and address)</i> Samples	ARCHITECT'S PROJECT NUMBER:	OWNER: ☐
	CONTRACT FOR:	ARCHITECT: ☐
TO OWNER: <i>(Name and address)</i> University of Maine System by and through University of Maine 5765 Service Building Orono, ME 04469	CONTRACT DATED:	CONTRACTOR: ☐
		SURETY: ☐
		OTHER: ☐

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the

(Insert name and address of Surety)

on bond of

(Insert name and address of Contractor)

, SURETY,

hereby approves the reduction in or partial release of retainage to the Contractor as follows:

The Surety agrees that such reduction in or partial release of retainage to the Contractor shall not relieve the Surety of any of its obligations to

(Insert name and address of Owner)

, CONTRACTOR,

as set forth in said Surety's bond.

, OWNER,

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:

(Insert in writing the month followed by the numeric date and year.)

(Surety)

(Signature of authorized representative)

(Printed name and title)

Attest:

(Seal):

00 62 79
SAMPLE
STORED MATERIALS

University of Maine System
by and through
University of Maine
5765 Service Building
Orono ME 04469

Project Title: _____

Location: University of Maine

Contractor: _____

Materials and/or equipment (hereinafter "Materials") that have not yet been incorporated into the work may be delivered and suitably stored, at the site or some other location agreed upon by the Owner. The Materials listed below have been estimated at 100% of the cost and will be stored at _____. The Owner will reimburse the Contractor based upon the prices included on the Schedule of Values Form, 00 62 73(AIA G703), less the cost of installation. The Contractor must complete sufficient copies of this Stored Materials Form, 00 62 79, to accompany the Application for Payment. The Contractor shall secure the signature of its bonding company on all forms and shall also provide a Power of Attorney from the bonding company.

SCHEDULE

Qty	Material/Equipment	Item in AIA G703		Unit Wholesale Price	Extended Wholesale Price
		Item No	Unit Price		
Total					

Surety _____

By: _____

Power of Attorney Must be Attached

Attorney-in-Fact

Date: _____

BILL OF SALE

The Contractor, _____, (will store/has stored) certain Materials (at the site of this project/at an approved warehouse/at bonded warehouse) and will be paid in accordance with the provisions of the General Conditions of the Contract for Construction. In consideration of the sum of \$_____ paid to the contractor by the Owner, and, in compliance with the provisions of the Contract, and, with the intention to be legally bound, the Contractor does hereby grant, bargain, sell and deliver unto the Owner, its successors and assigns, all and singular, the Materials described in the schedule above. The Contractor agrees that:

1. Contractor has good title to the Materials, free and clear of all liens and encumbrances, and title is granted to the Owner;
2. The Materials will be used only in the construction of the above referenced project, under the provisions of the Contract, and will not be diverted elsewhere without the prior written consent of the Owner;
3. The Materials have been delivered to and are at the places approved for storage, and they are clearly marked and identified as the property of the Owner and are stored in a safe and secure manner to protect from damage or loss;

4. The Contractor will pay all expenses in connection with the sale, delivery, storage, protection and insurance of Materials granted to the Owner.
5. The Contractor will remain responsible for the Materials, which will remain under its custody and control for all losses, and will fully indemnify the Owner for the cost of the Materials should the Materials be lost or damaged or stolen, regardless of exclusions in insurance policies required under this document. The contractor has insured the Materials against loss or damage by fire (with extended coverage), theft and burglary, with loss payable to the Owner;
6. The Contractor agrees that the quantities of Materials set forth in the Schedule of Values Form represents the maximum quantities for which it may be entitled to payment under the provisions of the contract;
7. The following information is included with this form:

- (1) An Application for Payment;
- (2) An invoice or copy of an invoice for Materials stored;
- (3) Evidence of payment, or when payment has not been made, a letter on the Contractor's letterhead authorizing payment to be made jointly to the Contractor and the Supplier;
- (4) Photographs showing the stored Materials and its location;
- (5) a fire and theft insurance policy rider for the stored Materials.
- (6) a warehouseman's receipt acknowledging that the Materials being stored at the warehouse are being held for the benefit of the Contractor or/or University.

Witness:

By: _____ (SEAL)
Principal/Contractor-Individual

Witness:

Principal/Contractor-Individual

_____ (SEAL)

_____ (SEAL)

_____ (SEAL)

_____ (SEAL)

Attest:

Secretary

Principal/Contractor-Corporation

By: _____
President

END OF SECTION 00 62 79



AIA[®] Document G716[™] – 2004

Request for Information (“RFI”)

TO:

FROM:

PROJECT:

Samples

ISSUE DATE:

RFI No.

PROJECT NUMBERS:

/

REQUESTED REPLY DATE:

COPIES TO:

RFI DESCRIPTION: *(Fully describe the question or type of information requested.)*

REFERENCES/ATTACHMENTS: *(List specific documents researched when seeking the information requested.)*

SPECIFICATIONS:

DRAWINGS:

OTHER:

SENDER'S RECOMMENDATION: *(If RFI concerns a site or construction condition, the sender may provide a recommended solution, including cost and/or schedule considerations.)*

RECEIVER'S REPLY: *(Provide answer to RFI, including cost and/or schedule considerations.)*

BY

DATE

COPIES TO

Note: This reply is not an authorization to proceed with work involving additional cost, time or both. If any reply requires a change to the Contract Documents, a Change Order, Construction Change Directive or a Minor Change in the work must be executed in accordance with the Contract Documents.



AIA[®] Document G710[™] – 2017

Architect's Supplemental Instructions

PROJECT: *(name and address)*

Samples

CONTRACT INFORMATION:

Contract For:

Date:

ASI INFORMATION:

ASI Number:

Date:

OWNER: *(name and address)*

University of Maine System
by and through
University of Maine
5765 Service Building
Orono, ME 04469

ARCHITECT: *(name and address)***CONTRACTOR:** *(name and address)*

The Contractor shall carry out the Work in accordance with the following supplemental instructions without change in Contract Sum or Contract Time. Proceeding with the Work in accordance with these instructions indicates your acknowledgment that there will be no change in the Contract Sum or Contract Time.

(Insert a detailed description of the Architect's supplemental instructions and, if applicable, attach or reference specific exhibits.)

ISSUED BY THE ARCHITECT:

ARCHITECT *(Firm name)*

SIGNATURE

PRINTED NAME AND TITLE

DATE



AIA[®] Document G714[™] – 2017

Construction Change Directive

PROJECT: *(name and address)*

Samples

CONTRACT INFORMATION:

Contract For:

Date:

CCD INFORMATION:

Directive Number:

Date:

OWNER: *(name and address)*

University of Maine System
by and through
University of Maine
5765 Service Building
Orono, ME 04469

ARCHITECT: *(name and address)*
CONTRACTOR: *(name and address)*

The Contractor is hereby directed to make the following change(s) in this Contract:
(Insert a detailed description of the change and, if applicable, attach or reference specific exhibits.)

PROPOSED ADJUSTMENTS

1. The proposed basis of adjustment to the Contract Sum or Guaranteed Maximum Price is:

- ☐ Lump Sum decrease of \$0.00
- ☐ Unit Price of \$ per
- ☐ Cost, as defined below, plus the following fee:
(Insert a definition of, or method for determining, cost)
- ☐ As follows:

2. The Contract Time is proposed to . The proposed adjustment, if any, is .

NOTE: The Owner, Architect and Contractor should execute a Change Order to supersede this Construction Change Directive to the extent they agree upon adjustments to the Contract Sum, Contract Time, or Guaranteed Maximum price for the change(s) described herein.

When signed by the Owner and Architect and received by the Contractor, this document becomes effective IMMEDIATELY as a Construction Change Directive (CCD), and the Contractor shall proceed with the change(s) described above.

Contractor signature indicates agreement with the proposed adjustments in Contract Sum and Contract Time set forth in this CCD.

ARCHITECT *(Firm name)*

OWNER *(Firm name)*

CONTRACTOR *(Firm name)*

SIGNATURE

SIGNATURE

SIGNATURE

PRINTED NAME AND TITLE

PRINTED NAME AND TITLE

PRINTED NAME AND TITLE

DATE

DATE

DATE



AIA[®] Document G709[™] – 2018

Proposal Request

PROJECT: *(name and address)*

Samples

CONTRACT INFORMATION:

Contract For:

Date:

Architect's Project Number:

Proposal Request Number:

Proposal Request Date:

OWNER: *(name and address)*

University of Maine System

by and through

University of Maine

5765 Service Building

Orono, ME 04469

ARCHITECT: *(name and address)***CONTRACTOR:** *(name and address)*

The Owner requests an itemized proposal for changes to the Contract Sum and Contract Time for proposed modifications to the Contract Documents described herein. The Contractor shall submit this proposal within Zero (0) days or notify the Architect in writing of the anticipated date of submission.

(Insert a detailed description of the proposed modifications to the Contract Documents and, if applicable, attach or reference specific exhibits.)

THIS IS NOT A CHANGE ORDER, A CONSTRUCTION CHANGE DIRECTIVE, OR A DIRECTION TO PROCEED WITH THE WORK DESCRIBED IN THE PROPOSED MODIFICATIONS.

REQUESTED BY THE ARCHITECT:

PRINTED NAME AND TITLE



AIA® Document G701™ – 2017

Change Order

PROJECT: *(Name and address)*
Samples

CONTRACT INFORMATION:
Contract For:
Date:

CHANGE ORDER INFORMATION:
Change Order Number:
Date:

OWNER: *(Name and address)*
University of Maine System
by and through
University of Maine
5765 Service Building
Orono, ME 04469

ARCHITECT: *(Name and address)*

CONTRACTOR: *(Name and address)*

THE CONTRACT IS CHANGED AS FOLLOWS:

(Insert a detailed description of the change and, if applicable, attach or reference specific exhibits. Also include agreed upon adjustments attributable to executed Construction Change Directives.)

The original Contract Sum was	\$	0.00
The net change by previously authorized Change Orders	\$	0.00
The Contract Sum prior to this Change Order was	\$	0.00
The Contract Sum will be increased by this Change Order in the amount of	\$	0.00
The new Contract Sum including this Change Order will be	\$	0.00

The Contract Time will be increased by Zero (0) days.
The new date of Substantial Completion will be

NOTE: This Change Order does not include adjustments to the Contract Sum or Guaranteed Maximum Price, or the Contract Time, that have been authorized by Construction Change Directive until the cost and time have been agreed upon by both the Owner and Contractor, in which case a Change Order is executed to supersede the Construction Change Directive.

NOT VALID UNTIL SIGNED BY THE ARCHITECT, CONTRACTOR AND OWNER.

ARCHITECT *(Firm name)*

CONTRACTOR *(Firm name)*

OWNER *(Firm name)*

SIGNATURE

SIGNATURE

SIGNATURE

PRINTED NAME AND TITLE

PRINTED NAME AND TITLE

PRINTED NAME AND TITLE

DATE

DATE

DATE



AIA® Document G704™ – 2017

Certificate of Substantial Completion

PROJECT: *(name and address)*

Samples

CONTRACT INFORMATION:

Contract For:

Date:

CERTIFICATE INFORMATION:

Certificate Number:

Date:

OWNER: *(name and address)*

University of Maine System
by and through
University of Maine
5765 Service Building
Orono, ME 04469

ARCHITECT: *(name and address)*
CONTRACTOR: *(name and address)*

The Work identified below has been reviewed and found, to the Architect's best knowledge, information, and belief, to be substantially complete. Substantial Completion is the stage in the progress of the Work when the Work or designated portion is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The date of Substantial Completion of the Project or portion designated below is the date established by this Certificate.

(Identify the Work, or portion thereof, that is substantially complete.)

ARCHITECT *(Firm Name)*
SIGNATURE
PRINTED NAME AND TITLE
DATE OF SUBSTANTIAL COMPLETION
WARRANTIES

The date of Substantial Completion of the Project or portion designated above is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below:

(Identify warranties that do not commence on the date of Substantial Completion, if any, and indicate their date of commencement.)

WORK TO BE COMPLETED OR CORRECTED

A list of items to be completed or corrected is attached hereto, or transmitted as agreed upon by the parties, and identified as follows:

(Identify the list of Work to be completed or corrected.)

The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Unless otherwise agreed to in writing, the date of commencement of warranties for items on the attached list will be the date of issuance of the final Certificate of Payment or the date of final payment, whichever occurs first. The Contractor will complete or correct the Work on the list of items attached hereto within () days from the above date of Substantial Completion.

Cost estimate of Work to be completed or corrected: \$

The responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work, insurance, and other items identified below shall be as follows:

(Note: Owner's and Contractor's legal and insurance counsel should review insurance requirements and coverage.)

The Owner and Contractor hereby accept the responsibilities assigned to them in this Certificate of Substantial Completion:

CONTRACTOR *(Firm Name)*
SIGNATURE
PRINTED NAME AND TITLE
DATE
OWNER *(Firm Name)*
SIGNATURE
PRINTED NAME AND TITLE
DATE

SECTION 00 65 19
CERTIFICATE OF COMPLETION FORM
(Final)

DATE:

PROJECT NAME: UM Demeritt Forest Sawmill

SUBSTANTIAL COMPLETION DATE:

FINAL COMPLETION is defined, in accordance with Article 9 of the A201 General Conditions of the Contract for Construction, as the date certified by the Architect when all the Work of the Project is fully complete, the Close-Out requirements of Paragraph 9.10 of the General Conditions have been completed, including the Close-Out Meeting and approval of Close-Out by the Architect, in accordance with Subparagraph 9.10.2, and the Contract fully performed in accordance with the Contract Documents, and the Contractor entitled to final payment.

The CONTRACTOR certifies that the Work is fully completed and was completed on or before Month, day, year, and submits herewith:

Application for Final Payment (AIA G702)
Affidavit of Payments (AIA G706)
Consent of Surety (AIA G707)
Releases of Liens (AIA G706A)
Waiver of Lien

CONTRACTOR:

By: _____ Date: _____
Name:

The ARCHITECT has inspected the Work and has determined that the Date of Final Completion was Month, day, year.

ARCHITECT:

By: _____ Date: _____
Name:

The OWNER hereby accepts the Work as fully complete and will make final payment.

OWNER:

By: _____ Date: _____
Ryan Ward
University of Maine System

END OF SECTION 00 65 19



AIA[®] Document G706[™] – 1994

Contractor's Affidavit of Payment of Debts and Claims

PROJECT: *(Name and address)*
Samples

ARCHITECT'S PROJECT NUMBER:

OWNER: ☐

ARCHITECT: ☐

CONTRACTOR: ☐

SURETY: ☐

OTHER: ☐

TO OWNER: *(Name and address)*
University of Maine System
by and through
University of Maine
5765 Service Building
Orono, ME 04469

CONTRACT FOR:
CONTRACT DATED:

STATE OF: *(State of Signature)*

COUNTY OF: *(County of Signature)*

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required. AIA Document G707, Consent of Surety, may be used for this purpose

Indicate Attachment ☐ Yes ☐ No

CONTRACTOR: *(Name and address)*

BY:

(Signature of authorized representative)

(Printed name and title)

The following supporting documents should be attached hereto if required by the Owner:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.
3. Contractor's Affidavit of Release of Liens (AIA Document G706A).

Subscribed and sworn to before me on this date:

Notary Public:

My Commission Expires:



AIA[®] Document G706A[™] – 1994

Contractor's Affidavit of Release of Liens

PROJECT: *(Name and address)*

Samples

ARCHITECT'S PROJECT NUMBER:

OWNER: ☐

CONTRACT FOR:

ARCHITECT: ☐

CONTRACT DATED:

CONTRACTOR: ☐

SURETY: ☐

OTHER: ☐

TO OWNER: *(Name and address)*

University of Maine System

by and through

University of Maine

5765 Service Building

Orono, ME 04469

STATE OF: *(State of Signature)*

COUNTY OF: *(County of Signature)*

The undersigned hereby certifies that to the best of the undersigned's knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

CONTRACTOR: *(Name and address)*

BY:

(Signature of authorized representative)

(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:

My Commission Expires:

SAMPLE

SECTION 00 65 19.17
WAIVER OF LIEN

DATE: _____

State of: _____

State of Signature

County of: _____

County of Signature

TO: University of Maine System
by and through
University of Maine
5765 Service Building
Orono, ME 04469

SUBJECT:

Project Name: project

Project Location: UNIVERSITY OF MAINE

Upon receipt of the sum of _____ (being the balance due us under the existing contract or subcontract agreement for work on the Subject Project) the undersigned agrees that it will waive and release the University of Maine System from any and all lien or claim or right to lien on the Subject Project under the Statutes of the state of Maine relating to liens for labor, materials and/or subcontracts furnished for the Subject Project on premises belonging to the University of Maine System.

Signed: _____

Title: _____

Firm Name: _____

NOTARY

Subscribed and sworn to before me this _____ day of _____, 20____.

Signature Notary Public

END OF SECTION 00 65 19.17

SUBCONTRACTOR/SUPPLIER CONDITIONAL
RELEASE AND WAIVER OF LIEN

DATE: _____

State of: _____
State of Signature

County of: _____
County of Signature

SUBJECT:

Project Name: _____

Project Location: _____

_____ (hereinafter called the Subcontractor) in consideration of the sum of \$ _____ to be paid to Subcontractor by _____ upon receipt of said payment does hereby release and forever discharge _____ and the **University of Maine System** from any and all workman's, materialman's, mechanic's, building or other liens, claims, causes of action, liabilities and other obligations with respect to the value of any and all work, services and materials furnished, performed, or supplied by the subcontractor to or in connection with the construction project known as the Insert Project Name Here located in Insert Location Here (hereinafter called the "Premises") through the date of _____. Subcontractor shall take all reasonable action to discharge any lien currently filed or pending against _____ and the **University of Maine System**, including without limitation the recording of instruments discharging said lien with the appropriate Registry of Deeds.

Subcontractor acknowledges that its receipt of said payment will constitute full and final payment for all work performed by Subcontractor through the date set forth above except for retainage if applicable, in the amount of (\$) _____.

Subcontractor further covenants and represents that all of the subcontract suppliers, mechanics, materialmen, and laborers listed below engaged by Subcontractor have been paid in full (less proper retainage if any) or shall be immediately paid in full from the proceeds of this current payment for all work done and or materials furnished to the Premises through the date set forth in the first paragraph above. The Subcontractor hereby agrees to indemnify, defend, and hold _____ and The **University of Maine System** harmless from any and all claims, including but not limited to attorney fees, claims for payment, and liens of any kind or nature filed or made by any person or entity based upon work done or materials furnished in connection with the Premises by the Subcontractor or any sub-subcontractor, suppliers, mechanics, materialmen, and laborers employed by Subcontractor through the date set forth in the first paragraph above. Subcontractor shall request any sub-subcontractor, suppliers, mechanics, materialmen, and laborers employed by Subcontractor through the date set forth in the first paragraph above to, and shall itself, take all reasonable action to discharge any lien in connection with payments owed by Subcontractor currently filed or pending against _____ and the **University of Maine System**, including without limitation the recording of instruments discharging said lien with the appropriate Registry of Deeds.

Major sub-subcontractors and suppliers whose contract or purchase order meets or exceeds \$5,000 working for said Subcontractor for the period stated above:

SECTION 00 65 19.18

The undersigned represents that he is authorized by all corporate or other action necessary to execute and deliver this release.

Signed: _____

Title: _____

Firm Name: _____

NOTARY

Subscribed and sworn to before me this _____ day of _____, 20_____.

Signature Notary Public

END OF SECTION 00 65 19.18



AIA[®] Document G707[™] – 1994

Consent Of Surety to Final Payment

PROJECT: *(Name and address)*
Samples

ARCHITECT'S PROJECT NUMBER:

OWNER: ☐

CONTRACT FOR:

ARCHITECT: ☐

CONTRACT DATED:

CONTRACTOR: ☐

SURETY: ☐

OTHER: ☐

TO OWNER: *(Name and address)*
University of Maine System
by and through
University of Maine
5765 Service Building
Orono, ME 04469

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the
(Insert name and address of Surety)

on bond of
(Insert name and address of Contractor)

, SURETY,

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall
not relieve the Surety of any of its obligations to
(Insert name and address of Owner)

, CONTRACTOR,

as set forth in said Surety's bond.

, OWNER,

IN WITNESS WHEREOF, the Surety has hereunto set its hand on this date:
(Insert in writing the month followed by the numeric date and year.)

(Surety)

(Signature of authorized representative)

(Printed name and title)

Attest:
(Seal):



AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

THE OWNER:

(Name, legal status and address)

University of Maine System
by and through

THE ARCHITECT:

(Name, legal status and address)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith. The Architect is the Initial Decision Maker for this Agreement.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

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§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade. Where the Procurement Requirements include provisions that portions of the Work be File Bid in accordance with the requirements of the Maine Bid Depository System, the subcontracts for these portions of the work will cover the same scope of work as defined by the Procurement Requirements and the File Bid and shall have the same contract amount as listed in the successful bid.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights. The provisions of this section shall not be deemed to modify the contract between the University of Maine System (the Owner) and the Architect under B102-2017 and B201-2017.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants. The provisions of this section shall not be deemed to modify the contract between the University of Maine System (the Owner) and the Architect under B102-2017 and B201-2017.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties ~~will use AIA Document~~ may use AIA Document G201-2013 Project Digital Data Protocol Form and E203™-2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

1. For the purpose of this Contract, the Owner is defined as: University of Maine System, acting through its duly authorized agent.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior-to-Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. ~~The Contractor shall have no obligation to commence the Work until the Owner provides such evidence.~~ If commencement of the Work is delayed under this Section 2.2.1, the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended ~~appropriately~~ appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor. Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. Architect is a person or entity lawfully licensed to practice in the State of Maine. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number. Whenever the prime professional designer for the Work is an Engineer, the term Architect, wherever used in these documents shall have the term Engineer substituted for the term Architect. The Engineer shall be lawfully licensed to practice engineering in the State of Maine or an entity lawfully practicing engineering identified as such in the Agreement.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work at all times conduct safe performance of the Work, including but not limited to appropriate precautions.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner

to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

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

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors,

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inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best industry standard or better skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.2.1 After the Contract has been executed, the Owner and Architect may consider a formal request for substitution of products in place of those specified. The Owner shall deduct from the next payment made from the Contract Sum amounts paid to the Architect to evaluate the Contractor's proposed substitutions and to make agreed-upon changes in the Drawings and Specifications made necessary by the Owner's acceptance of the substitutions. By making requests for substitutions, the Contractor

- .1 Represents that the Contractor has personally investigated the proposed substitute product and determined it is equal or superior in all respects to that specified;
- .2 Represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;
- .3 Certifies that the cost data presented is complete and includes all related costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and,
- .4 Will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be completed in all respects.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.4.4 If a wage scale prepared by the State of Maine Department of Labor, Bureau of Labor Standards, is included in the Contract Documents, such wage scale represents the minimum wages that must be paid in each category of labor employed on the project.

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The provisions of Title 26 MRSA Chapter 15 Preference to Maine Workers and Contractors, apply to this project, including but not limited to:

§ 1310. Wage and benefits rates to be kept posted

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.

§ 1311. Wage and benefit record of contractor

The contractor and each subcontractor in charge of the construction of a public work shall keep an accurate record showing the names and occupation of all laborers, workers and mechanics employed by them and all independent contractors working under contract with them in connection with the construction on the public works. The record must also show for all laborers, workers, mechanics and independent contractors the hours worked, the title of the job, the hourly rate or other method of remuneration and the actual wages or other compensation paid to each of the laborers, workers, mechanics and independent contractors. A copy of such a record must be kept at the job site and must be open at all reasonable hours to the inspection of the Bureau of Labor Standards and the public authority that let the contract and its officers and agents. It is not necessary to preserve those records for a period longer than 3 years after the termination of the contract. A copy of each such record must also be filed monthly with the public authority that let the contract. The filed record is a public record pursuant to Title 1, chapter 13, except that the public authority letting a contract shall adopt rules to protect the privacy of personal information contained in the records filed with the public authority under this section, such as Social Security numbers and taxpayer identification numbers. The rules may not prevent the disclosure of information regarding the classification of workers or independent contractors and the remuneration they receive. Such rules are routine technical rules as defined by Title 5, chapter 375, subchapter 2-A.

§ 3.4.5 If a wage scale prepared by the U.S. Department of Labor pursuant to the provision of the Davis-Bacon Act is included in the Contract Documents, such wage scale represents the minimum wages that must be paid in each category of labor on the project. The requirements and responsibilities within the Davis-Bacon Act apply to this project if a Davis-Bacon wage scale is included.

§ 3.4.6 EQUAL EMPLOYMENT OPPORTUNITY

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

- .1 The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, including transgender status, gender, gender identity or gender expression, ethnicity, national origin or citizenship status, familial status, ancestry, age, disability physical or mental, genetic information, veteran or military status status. Such action shall include, but not be limited to, the following: employment, upgrading, demotions, transfers, recruitment or recruitment advertising; layoffs or terminations; rates of pay or other forms of compensation; and selection for training, including apprenticeship.
- .2 The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, including transgender status, gender, gender identity or gender expression, ethnicity, national origin or citizenship status, familial status, ancestry, age, disability physical or mental, genetic information, veteran or military status.
- .3 The contractor will send to each labor union or representative of the workers with which there is a collective or bargaining agreement in place, or other contract or understanding, whereby labor is being furnished for the performances of his contract, a notice, as set forth by the Maine Human Rights Commission, found on their website (https://www1.maine.gov/mhrc/guidance/mhra_guarantees.htm), to be provided by the contracting department or agency, advising the said labor union or workers' representative of the contractor's commitment under the provisions of the contract, and shall post copies of the notice in conspicuous places available to employees and to applicants for employment.
- .4 The contractor will cause the foregoing provisions to be inserted in all contracts for any work covered by this agreement so that such provisions will be binding upon each subcontractor.

.5 Contractors and subcontractors with contracts in excess of \$50,000 will also pursue in good faith affirmative action programs.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.6.1 The University of Maine System is exempt from payment of taxes under the Maine Sales and Use Tax Law Title 36 Section 1760 for taxes on materials that are permanently incorporated into the real property belonging to the University of Maine System. The University of Maine System is also exempt from the payment of Federal Excise Taxes on articles not for resale and from the Federal Transportation Tax on all shipments; exemption certificates for these taxes will be furnished when required. All quotations shall be less these taxes. The contractor shall pay all other taxes that have been or are legally enacted.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions disturbed. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim proceed as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately

suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

- .1 The Contractor shall provide an updated Construction Schedule with each Application for Payment reflecting actual construction progress and activities.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.12.11 The Architect's review of the Contractor's submittals will be limited to examination of an initial submission and two (2) resubmittals. The Architect's review of additional submittals will be made only with the consent of the Owner after notification by the Architect. The Owner shall deduct from the next payment made from the Contract Sum amounts paid to the Architect for evaluation of such additional submittals.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.15.3 Waste Management. The University is committed to a resource management strategy which reduces to a minimum the production of waste material while reusing, recycling or composting as much as possible of the remaining materials. Contractor will submit a construction waste management plan for the project that identifies opportunities to reduce, reuse, or recycle waste from renovations or new construction.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the final payment is due, and from time to time during the period for correction of Work described in § 12.2, and until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, endeavor to guard the Owner against defects and deficiencies in the Work, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the

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construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

- .1 The Contractor shall reimburse the Owner for compensation paid to the Architect for additional site visits made necessary by the fault, neglect as determined solely by the Owner, or request of the Contractor. The reimbursement shall be deducted from the next payment made from the Contract Sum following the Owner's payment to the Architect.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably-informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

- 1 The Contractor shall provide Owner 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. The list shall be presented at the preconstruction meeting and, when changes occur, at each requisition meeting as necessary.
- 2 Where the use of the Maine Bid Depository is required by the Procurement Requirements, Subcontractors included in the Contractor's Proposal shall be the Subcontractors for the defined Work unless a change has been approved by the Owner.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or

Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction

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schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.1.4 The combined overhead and profit included in the total cost to the Owner of a Change in the Work shall be based on a previously agreed upon unit pricing or on the following schedule allowing for appropriate allowances for contract duration:

.1 For the Contractor, for Work performed by the Contractor's own forces, 20% of the cost.

- .2 For the Contractor, for Work performed by the Contractor's Subcontractors, 10% of the amount due the Subcontractors.
- .3 For each Subcontractor involved, for Work performed by the Subcontractor's own forces, 20% of the cost.
- .4 For each Subcontractor involved, for Work performed by the Subcontractor's Sub-subcontractors, 10% of the amount due the Sub-subcontractor.
- .5 Costs to which overhead and profit is to be applied shall be limited to the following:
 - .1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
 - .2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
 - .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others; and,
 - .4 Costs of premiums for all bonds, insurance, permit fees, and sales, use or similar taxes related to the Work.

§ 7.1.5 When there is only an extension of Contract Time, any Claim for delay made pursuant to Article 15 is limited to additional costs related to supervision and field office personnel, which may be included in the overhead and profit calculation.

§ 7.1.6 In order to facilitate checking of quotations, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by complete itemization of costs including labor, materials and Subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are Subcontracts, they are to be itemized also. In no case will a change be approved without such itemization.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may

prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.1.3 The provisions of Title 5 M.R.S.A § 1746, as amended, pertain to this project. The Owner shall retain five percent (5%) of each payment due the Contractor as part of the security for the fulfillment of the Contract Agreement by the Contractor; the Contractor shall not withhold a greater percentage from subcontractors. The Owner may, if deemed expedient by the Owner, cause the Contractor to be paid temporarily or permanently from time to time during the progress of the work, such portion of the amount retained as the Owner deems prudent or desirable.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect ~~may~~ shall withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to

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make such representations to the Owner. The Architect ~~may~~ shall also withhold a Certificate for Payment or, because of subsequently discovered evidence, ~~may~~ shall nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work, i.e. Work that does not conform to the requirements of the Contract, shall include, but not be limited to, non-conforming Work, disputed Work, incomplete Work, and unacceptable Work, which is not remedied;
 - .1 The Architect shall deduct and withhold from any certification for payment an amount equal to one hundred and fifty percent (150%) the value of any defective Work.
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a Separate Contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.6.9 All Progress Payments and Final Payment are subject to the requirements of the "Maine Prompt Pay Act" Title 10 M.R.S.A. ch. 201-A, as amended. Payments shall be made on a timely basis in accord with the requirements of this Statute; however, the Contractor waives interest on any late payment.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

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§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

- .1 Except with the consent of the Owner, the Architect will perform no more than three (3) site reviews to determine whether the Work or a designated portion thereof has attained Final Completion in accordance with the Contract Documents. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for any additional site reviews.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to

certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- .1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents;
- .3 terms of special warranties required by the Contract Documents; or
- .4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

§ 9.11 The Contractor and the Contractor's Surety, if any, shall be liable for and shall pay the Owner the sums stipulated as liquidated damages in the Contract Documents for each calendar day of delay after the date established for Substantial Completion in the Contract Documents until the Work is substantially complete.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.
- .4 If this Contract involves renovation, repair, or preparation of surfaces for painting in pre-1978 apartments, houses, or spaces used by child care facilities, Contractor shall use certified workers who follow the lead-safe work practices as required by the US Environmental Protection Agency's Renovation, Repair and Remodeling rule described in 40 CFR § 745.85. Notification of the tenants or users under this rule will be the responsibility of the Owner.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to

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the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. ~~Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection.~~ When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. ~~By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.~~

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, ~~including but not limited to exclusive of attorneys' fees,~~ arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity. This indemnification obligation shall not apply to any claim for which Owner would not be liable under the Maine Tort Claims Act (14 M.R.S.A. '8101, et seq.) if such claim were made directly against Owner and Owner shall continue to enjoy all rights, claims, immunities and defenses available to it under law.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the

Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby ~~incurred~~incurred, exclusive of attorneys' fees.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards ~~however caused~~caused, with the exception of intentional acts or grossly negligent consultants, contractors or sub-contractors.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have ~~14~~30 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising

out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

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§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

~~Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.~~

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 ~~The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.~~

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- .3 ~~repeatedly~~ disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

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- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the ~~Agreement~~Agreement; but not including overhead and profit on Work not executed.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law,

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but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

1. damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and
2. damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision

shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of

60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 ~~If the~~ The parties have selected arbitration as the method for binding dispute resolution in the Agreement, any ~~Claim~~ this Agreement, any claim, dispute or other matter in question arising out of or related to this Agreement subject to, but not resolved by, mediation shall be subject to ~~arbitration which, arbitration, which~~ unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association conducted in the place where the Project is located, unless another place is mutually agreed upon, and in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. ~~The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon, this Agreement, except that the parties shall select only one Arbitrator, and there shall be no discovery. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, this Agreement, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded, defended.~~

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

SECTION 00 73 00.11

SAMPLE

SCHEDULE OF LIQUIDATED DAMAGES

Liquidated damages (a fixed amount set forth in the Contract) agreed to by the Owner and the Contractor are intended to compensate the Owner for unexcused delay in the performance of the Contract. The parties agree that the purpose of the liquidated damages schedule below is to establish, in advance, a reasonable estimate of the damages that would be incurred by the Owner if there is an unexcused delay, or a breach of Contract, which causes the work to be extended beyond the contractual substantial completion date. This agreement of liquidated damages by the parties is made to establish the reasonableness of them to the actual damages an Owner may have incurred due to unexcused delays by the Contractor, even though the actual damages may be an uncertain amount and unprovable.

The specific per diem rates of Liquidated Damages are (____/[enter amt if can reasonably determine-provide method of determination; otherwise] set forth below). By executing the Contract, the Contractor acknowledges that such an amount is not a penalty and that the daily amount set forth in the Contract is a reasonable per diem forecast of damages incurred by the Owner due to the Contractor's failure to complete the Work within the Contract Time.

Original Contract Amount		Per Diem Amount of Liquidated Damages
From More Than	To and Including	
0	\$100,000	\$500
\$100,000	\$300,000	\$675
\$300,000	\$500,000	\$750
\$500,000	\$1,000,000	\$825
\$1,000,000	\$2,000,000	\$1,000
\$2,000,000	\$4,000,000	\$1,250
\$4,000,000	and more	\$1,500

END OF SECTION 00 73 00.11



AIA® Document A101® – 2017 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the N/A day of in the year Sample
(In words, indicate day, month and year.)

for the following **PROJECT**:
(Name and location or address)

THE OWNER:
(Name, legal status and address)

University of Maine System
by and through
University of Maine
5765 Service Building
Orono, ME 04469

THE CONTRACTOR:
(Name, legal status and address)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This document is intended to be used in conjunction with AIA Document A201®–2017, General Conditions of the Contract for Construction. Article 11 of A201®–2017 contains additional insurance provisions.

TABLE OF ARTICLES

- A.1 GENERAL**
- A.2 OWNER'S INSURANCE**
- A.3 CONTRACTOR'S INSURANCE AND BONDS**
- A.4 SPECIAL TERMS AND CONDITIONS**

ARTICLE A.1 GENERAL

The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.2.2 Liability Insurance

The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

§ A.2.3 Required Property Insurance

§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 **Causes of Loss.** The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:

(Indicate below the cause of loss and any applicable sub-limit.)

§ A.2.3.1 For this project, Property Insurance coverage, up to the total amount of the Project, will be provided by the University by either adding the Project to the University's existing master property insurance or purchasing a stand-alone builder's risk policy. Coverage shall be included for the Contractor and all Subcontractors, as their interests may appear, while involved in the Project and until the work is completed or the contractor is otherwise advised in writing. This insurance is limited to the "all risk" type coverage provided under the University's master property insurance for direct physical loss or damage to the building or building materials related to the project, subject to standard policy limitations and exclusions. The contractor is responsible for a \$10,000 per claim deductible. Any other insurance desired by the Contractor beyond that covered by the University's insurance, or to cover the \$10,000 deductible, is the responsibility of the Contractor. This contract stands as verification of the University's property insurance coverage on the project and no further verification will be provided.

Causes of Loss

Sub-Limit

§ A.2.3.1.2 **Specific Required Coverages.** The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:

(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage

Sub-Limit

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 **Deductibles and Self-Insured Retentions.** If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.

§ A.2.3.2 **Occupancy or Use Prior to Substantial Completion.** The Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of

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coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures

If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ A.2.4 Optional Extended Property Insurance.

The Owner shall purchase and maintain the insurance selected and described below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

- ☐ **§ A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance**, to reimburse the Owner for loss of use of the Owner's property, or the inability to conduct normal operations due to a covered cause of loss.
- ☐ **§ A.2.4.2 Ordinance or Law Insurance**, for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.
- ☐ **§ A.2.4.3 Expediting Cost Insurance**, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.
- ☐ **§ A.2.4.4 Extra Expense Insurance**, to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.
- ☐ **§ A.2.4.5 Civil Authority Insurance**, for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.
- ☐ **§ A.2.4.6 Ingress/Egress Insurance**, for loss due to the necessary interruption of the insured's business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.
- ☐ **§ A.2.4.7 Soft Costs Insurance**, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects,

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engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

§ A.2.5 Other Optional Insurance.

The Owner shall purchase and maintain the insurance selected below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

☐ § A.2.5.1 Cyber Security Insurance for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information. *(Indicate applicable limits of coverage or other conditions in the fill point below.)*

☐ § A.2.5.2 Other Insurance
(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage

Limits

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies.

§ A.3.1.1.1 Certificates of Insurance filed with the University of Maine System shall indicate the Certificate Holder as:

University of Maine System
Office of Risk Management
Robinson Hall
46 University Drive
Augusta, ME 04330

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04. All required insurance shall be provided by companies that have a current A.M. Best insurance rating of A- or better and that are licensed or approved to do business in the State of Maine.

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§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than two million dollars (\$ 2,000,000) each occurrence, two million dollars (\$ 2,000,000) general aggregate, and two million dollars (\$ 2,000,000) aggregate for products-completed operations hazard, providing coverage for claims including

- .1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
- .2 personal injury and advertising injury;
- .3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
- .4 bodily injury or property damage arising out of completed operations; and
- .5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

- .1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.
- .2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.
- .3 Claims for bodily injury other than to employees of the insured.
- .4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.
- .5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.
- .6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.
- .7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.
- .8 Claims related to roofing, if the Work involves roofing.
- .9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.
- .10 Claims related to earth subsidence or movement, where the Work involves such hazards.
- .11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than one million dollars (\$ 1,000,000) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.

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§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than five hundred thousand dollars (\$ 500,000.) each accident, five hundred thousand dollars (\$ 500,000.) each employee, and five hundred thousand dollars (\$ 500,000.) policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and ~~docks~~ docks. Policy limits for such coverage shall not be less than five hundred thousand dollars (\$500,000) each accident, five hundred thousand dollars (\$500,000) each employee, and five hundred thousand dollars (\$500,000) policy limit. Contractor is required to provide proof of such coverage, if applicable to the Work, by submitting a copy of the endorsement or by submitting the USLH form WC 00 01 06 A (current edition).

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than one million dollars (\$ 1,000,000.) per claim and one million dollars (\$ 1,000,000.) in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than one million dollars (\$ 1,000,000.) per claim and two million dollars (\$ 2,000,000.) in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than one million dollars (\$ 1,000,000.) per claim and two million dollars (\$ 2,000,000.) in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than two million dollars (\$ 2,000,000.) per claim and two million dollars (\$ 2,000,000.) in the aggregate.

§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than one million dollars (\$ 1,000,000.) per claim and one million dollars (\$ 1,000,000.) in the aggregate. Authorization from Administration of the University of Maine System must be obtained thirty (30) days prior to the utilization of the equipment.

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

N/A

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.

(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

[] **§ A.3.3.2.1** Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such ~~insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3-insurance.~~ The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any

deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:

(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

- [] **§ A.3.3.2.2 Railroad Protective Liability Insurance**, with policy limits of not less than (\$) per claim and (\$) in the aggregate, for Work within fifty (50) feet of railroad property.
- [] **§ A.3.3.2.3 Asbestos Abatement Liability Insurance**, with policy limits of not less than one million dollars (\$ 1,000,000) per claim and two million dollars (\$ 2,000,000) in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.
- [] **§ A.3.3.2.4 Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.**
- [] **§ A.3.3.2.5 Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.**
- [] **§ A.3.3.2.6 Other Insurance**
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage

Limits

§ A.3.4 Performance Bond and Payment Bond

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows: and the Contractor shall furnish a Performance Bond and a Payment Bond covering the faithful performance of the Contract and payment of obligations arising thereof. Bonds may be obtained through the Contractor's usual source and the cost thereof shall be included in the Contract Sum. The amount of each bond shall be equal to 100% of the Contract Sum. Should the Contract Sum change during the contract and warranty periods, the amount of the Bonds will be changed to reflect the Contract Sum.

- .1 The Contractor shall deliver the required bonds to the Owner at the same time as the signed Contract Agreement is delivered to the Owner. Prior to the commencement of the Work, the Contractor shall submit satisfactory evidence that such bonds will be furnished.

(Specify type and penal sum of bonds.)

- .2 The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

Type

Penal Sum (\$0.00)

Payment Bond

Performance Bond

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

.3 The Contract Bonds shall continue in effect for one year after final acceptance of each contract to protect the Owner's interest in connection with the one year guarantee of workmanship and materials

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and to assure settlement of claims, for the payment of all bills for labor, materials, and equipment by the Contractor.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

N/A



00 73 46
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.

2026 Fair Minimum Wage Rates – Building 2 Penobscot County (other than 1 or 2 family homes)

Occupational Title	Minimum Wage	Minimum Benefit	Total
Brickmasons and Blockmasons	\$43.02	\$7.64	\$50.66
Bulldozer Operator	\$30.62	\$5.38	\$36.00
Carpenter	\$30.01	\$19.69	\$49.70
Cement Masons and Concrete Finisher	\$24.42	\$2.52	\$26.94
Construction and Maintenance Painters	\$23.96	\$1.59	\$25.55
Construction Laborer	\$21.90	\$19.72	\$41.62
Conveyor Operators and Tenders	\$30.17	\$13.77	\$43.94
Crane and Tower Operators	\$40.43	\$8.63	\$49.06
Crushing Grinding and Polishing Machine Operators	\$26.15	\$3.24	\$29.39
Earth Drillers - Except Oil and Gas	\$25.04	\$3.77	\$28.81
Electrical Power - Line Installer and Repairers	\$48.12	\$15.63	\$63.75
Electricians	\$38.74	\$21.14	\$59.88
Elevator Installers and Repairers	\$67.34	\$39.76	\$107.10
Excavator Operator	\$34.12	\$6.49	\$40.61
Fence Erectors	\$30.90	\$2.18	\$33.08
Flaggers	\$21.39	\$0.86	\$22.25
Floor Layers - Except Carpet/Wood/Hard Tiles	\$29.00	\$8.65	\$37.65
Glaziers	\$23.73	\$4.62	\$28.35
Hazardous Materials Removal Workers	\$24.12	\$1.60	\$25.72
Heating and Air Conditioning and Refrigeration Mechanics and Installers	\$32.88	\$4.41	\$37.29
Heavy and Tractor - Trailer Truck Drivers	\$24.44	\$2.50	\$26.94
Highway Maintenance Workers	\$23.30	\$1.14	\$24.44
Industrial Machinery Mechanics	\$29.97	\$6.74	\$36.71
Industrial Truck and Tractor Operators	\$24.61	\$4.21	\$28.82
Insulation Worker - Mechanical	\$27.35	\$6.05	\$33.40
Light Truck or Delivery Services Drivers	\$26.79	\$5.14	\$31.93
Loading Machine and Dragline Operators	\$29.71	\$4.79	\$34.50
Millwrights	\$35.99	\$10.52	\$46.51
Mobile Heavy Equipment Mechanics - Except Engines	\$30.67	\$5.10	\$35.77
Operating Engineers and Other Equipment Operators	\$39.74	\$3.67	\$43.41
Paving Surfacing and Tamping Equipment Operators	\$30.74	\$10.67	\$41.41
Pile-Driver Operators	\$37.15	\$3.12	\$40.27
Pipe/Steam/Sprinkler Fitter	\$43.76	\$25.44	\$69.20
Pipelayers	\$28.75	\$3.64	\$32.39
Plumbers	\$40.00	\$24.71	\$64.71
Radio Cellular and Tower Equipment Installers	\$34.72	\$5.63	\$40.35
Reinforcing Iron and Rebar Workers	\$33.35	\$27.55	\$60.90
Riggers	\$27.16	\$21.25	\$48.41
Roofers	\$24.71	\$4.70	\$29.41
Sheet Metal Workers	\$24.97	\$5.69	\$30.66
Structural Iron and Steel Workers	\$27.16	\$21.25	\$48.41
Tapers	\$29.16	\$5.64	\$34.80
Telecommunications Equipment Installers and Repairers - Except Line Installers	\$37.09	\$10.21	\$47.30
Telecommunications Line Installers and Repairers	\$28.49	\$5.29	\$33.78
Tile and Marble Setters	\$28.91	\$5.46	\$34.37

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

Supersedes 02-03-2025
Effective 01-10-2026

SECTION 01 11 00
SUMMARY OF WORK

PART 1 GENERAL

1.01 SUMMARY

- A. The project consists of new construction of a single classroom and pavilion space for portable sawmill training.

Bid Schedule:

Bid advertised: Saturday, January 31, 2026

Non-mandatory pre-bid meeting: Tuesday, February 10, 2026, 10:00 AM

Questions Due: Thursday, February 12, 2026 4:00 PM

Response to Questions by: Thursday, February 14, 2026 4:00PM

Bid Opening-Bids received until: Thursday, February 26, 2026 2:00PM

Substantial completion date: December 31, 2026

1.02 LID POLICY

University of Maine Projects are required to comply with the Maine Department of Environmental Protection policies regarding Stormwater Management. The University has developed a Low Impact Development (LID) Policy which will be followed by the University in the design and implementation of projects.

Section 1: Purpose

Low Impact Development (LID) is a stormwater management approach that protects public health, safety, and general welfare by minimizing the adverse effects of development and redevelopment on the environment. LID is a broad approach to site planning that preserves natural resources, processes, and habitats. It defines what portions of the site are suitable for development and then utilizes Stormwater Treatment Measures (STMs) to manage runoff from the proposed developed impervious areas. In LID, STMs using natural processes such as vegetated buffers are given preference over constructed treatment STMs. The goals of LID are to minimize the environmental impacts of development, such as flooding, erosion, and water pollution. This LID Policy was developed to comply with the requirements of the 2022 General Permit for the Discharge of Stormwater from Small State and Federally Owned Municipal Separate Storm Sewer Systems (MS4s).

Section 2: Definitions

Construction Activity – Means any activity on a site that results in disturbed area.

Discharge- Means any spilling, leaking, pumping, pouring, emptying, dumping, disposing or other addition of pollutants to the Waters of the State, other than groundwater.

Disturbed Area- Means all land areas of a Site that are stripped, graded, grubbed, filled, or excavated at any time during the site preparation or removing vegetation for, or construction of, a Project. Cutting of trees, without grubbing, stump removal, disturbance, or exposure of soil is not considered Disturbed Area. Disturbed Area does not include routine maintenance but does include Redevelopment and new Impervious Areas. "Routine maintenance" is maintenance performed to maintain the original line and grade, hydraulic capacity, and original purpose of the facility. Paving impervious gravel surfaces provided that an applicant or permittee can prove the original line and grade and hydraulic capacity shall be maintained and original purpose of the surface remains the same is considered routine maintenance. Replacement of a building is not considered routine maintenance of the building and is therefore considered Disturbed Area.

Impervious Area- Means the total area of a Parcel covered with a low-permeability material that is highly resistant to infiltration by water, such as asphalt, concrete, or rooftop, and areas such as gravel roads and unpaved parking areas that will be compacted through design or use to reduce their permeability. Common Impervious Areas include, but are not limited to, rooftops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel roads, packed earthen materials, and macadam or other surfaces which similarly impede the natural infiltration of stormwater. Pervious pavement, pervious pavers, pervious concrete, and under drained artificial turf fields are all considered impervious.

Low Impact Development (LID)- Means a broad approach to site planning that preserves natural resources, processes, and habitat, defines what portions of the Site are suitable for development and then utilizes STMs to manage Runoff from the proposed developed impervious areas. In LID, Stormwater Treatment Measures using natural processes such as vegetated buffers are given preference over constructed treatment Stormwater Treatment Measures. The goals of LID are to minimize the environmental impacts of the development.

Maine Native Vegetation- Means vegetation including grass seed mixtures, identified as native to Maine from lists maintained by: US Department of Agriculture Hardiness Zones by the Maine Cooperative Extension, Wild Seed Project, Regional Soil and Water Conservation District, Maine YardScaping Program, or a Maine Licensed Landscape Architect.

New Development- means activity undertaken to develop property, including but not limited to: the construction of buildings, parking lots, roads and other new impervious surfaces; landscaping; and other activities that disturb land areas. New Development or Construction does not include Redevelopment or maintenance.

Project- Means Construction Activity undertaken for New Development or Redevelopment, both as defined in the General Permit, located on a Site that will Discharge Stormwater to a Small MS4 located partially or entirely within the Urbanized Area.

Redevelopment- means an activity, not including maintenance, undertaken to redevelop or otherwise improve property in which the newly developed area is located within the same footprint as the existing developed area.

Runoff- Means the part of precipitation from rain or melting ice and snow that flows across a surface as sheet flow, shallow concentrated flow or in Drainageways.

Site- Means the portion of a Lot, Parcel, or Common Plan of Development which is proposed for Construction Activity, including open space, Stormwater Treatment Measures, and Disturbed Area, subject to this policy.

Stream Crossing- Means the mechanism by which any road, sidewalk, or other structural feature of a Site will cross or pass over or through a Water of the State which has a stream bank full width of 6 feet or less.

Stream Crossing designed in accordance with Maine Stream Smart Principles- Means a Stream Crossing designed by a Maine Professional Engineer who has completed the Maine Audubon Society Stream Smart Workshops (Parts I and II), which includes the standards recommended by that program's stream span, elevation, slope and skew and substrate to promote passage of fish and other organisms and to limit road-damaging flows from extreme weather.

Stormwater Treatment Measure- Means a Stormwater management system or innovative treatment measure as described in Chapter 500 4.c.(3) Types of treatment measures allowed. These measures include wet ponds, vegetated soil filters, infiltration, buffers, or innovative treatment measures. For purposes of this Ordinance these are cumulatively referred to as Stormwater Treatment Measures, or individually referred to as Stormwater Treatment Wet Pond,

Stormwater Treatment Vegetated Soil Filter, Stormwater Treatment Infiltration Measure, Stormwater Treatment Buffer, or Stormwater Treatment Innovative Measure.

Section 3: Applicability

If a proposed development or redevelopment project meets the following threshold, it is subject to the Lid requirements in this Policy:

- ☐ Projects that disturb ≥ 1.0 acre
- ☐ Projects that disturb < 1.0 acre that are part of a larger common plan of development or sale that cumulatively exceeds 1.0 acre of disturbance

Section 4: Required Low Impact Development Performance Standards

1. Minimize site clearing
2. Protect natural drainage system
3. Minimize the decrease in time of concentration
4. Minimize impervious area or the effect of impervious area
5. Minimize soil compaction
6. Minimize lawns and maximize landscaping that encourages runoff retention
7. Provide vegetated open-channel conveyance systems
8. Rainwater is stored for later reuse for the building or landscape

Section 5: Design Requirements

For proposed development & redevelopment projects subject to this policy per Section 3, the following must be provided by a State of Maine Licensed Professional Engineer (PE) to clearly demonstrate that LID strategies were implemented throughout the design process:

- ☐ The 'LID Submittal Checklist' (Table 1) within this policy outlining in detail what LID design elements were utilized in the project and/or why elements could not be incorporated into the project.
- ☐ Design plans including appropriate details showing the LID design elements referenced in Table 1.

Section 6: Design Review & Conformance

The Licensed Design Professional will analyze the existing site and the proposed design to determine whether the required LID measures are included to the Maximum Extent Practicable (MEP) in the project contract documents. As part of the process the University will review and approve the design for conformance to the Low Impact Development Policy prior to project execution. Table 1 below will be included as part of the contract documents and will be provided as part of all applications to regulatory agencies.

In order to demonstrate that LID measures were utilized to the Maximum Extent Practicable (MEP), the Contract Documents must clearly show how Section 4 requirements have been met:

1. How applicable LID measures were implemented
2. Reasoning why some LID measures could not be implemented into the project due to:
 - a. Technical infeasibility, or
 - b. Site-specific characteristics.

LID Submittal Checklist (Table 1)

Lid Performance Standards	Typical design methods to achieve lid performance standard (but not limited to)	<u>Required Application Response</u> How was this lid performance standard implemented or taken into consideration during project design?	<u>University Review and approval of the Design Documents for conformance to the MEP.</u>
1 Minimize Site Clearing	A) Project plans depict limits of disturbance and limits are established on-site prior to disturbance using flagging or fencing. B) Promote compact development. C) Place parking underneath or inside structures.		
2 Protect Natural Drainage System	A) Maintain a minimum 25' buffer on all natural water resources including intermittent channels. B) Utilize Maine Stream Smart Principles for Proposed stream crossings. C) Utilize natural flow patterns for the post-construction drainage system.		
3 Minimize the decrease in time of concentration	A) Break up or disconnect the flow of runoff over impervious surfaces via vegetated buffers. B) Detain flows onsite. C) Promote sheet flow over pavement that is less than 100 feet in length or width. D) Increase flow lengths or the surface roughness of the flow path (i.e. vegetated open channels).		
4 Minimize impervious area or the effect of impervious area	A) Go vertical with multi-story buildings and parking garages. B) At least 70% of roadway runoff shall be directed into stormwater treatment measures. C) Utilize pervious ground treatments. D) Minimize the number and size of proposed parking spaces. E) Minimize the length/and widths of proposed roads and driveways.		
5 Minimize soil compaction	A) Minimize construction B) Construction equipment movement, laydown areas, and parking shall be restricted to the disturbed area. C) Rototill all areas to be revegetated		
6 Minimize lawns and maximize landscaping that encourages runoff retention	A) Propose low-maintenance Maine native plant species B) Minimize lawns and maximize vegetated buffers C) Utilize 4" minimum quality topsoil with high organic content or clean compost material		
7 Provide vegetated open-channel conveyance systems	A) Runoff from on-site roofs, sidewalks, and peak-use overflow parking runoff shall be directed into Stormwater treatment Buffers or Stormwater Treatment Infiltration Measures. B) Level spreaders to buffers where possible.		

Lid Performance Standards		Typical design methods to achieve lid performance standard (but not limited to)	<u>Required Application Response</u> How was this lid performance standard implemented or taken into consideration during project design?	<u>University Review and approval of the Design Documents for conformance to the MEP.</u>
		C) Underdrained swales.		
8	Rainwater is stored for later reuse for the building or landscape	A) Require the implementation of precipitation storage (e.g., cisterns or rain barrels) for later reuse for landscaping.		

END OF SECTION 01 11 00

SECTION 01 14 00
WORK RESTRICTIONS

PART 1 GENERAL

1.01 PROJECT CONDITIONS

- A. Tobacco Free Campus Policy: On January 1, 2011 the University System adopted a tobacco free campus policy. As of January 1, 2012 compliance with the tobacco free campus policy became mandatory. This paragraph serves as notification to Contractor of the policy and provides the parameters of compliance enforcement. Contractor shall be responsible for notifying its workers and subcontractors regarding the policy and for enforcement of the policy with same. Noncompliance will be managed as follows:

1. First offense – notify Contractor to remind employee and/or subcontractor of policy.
2. Second offense – contractor/subcontractor employee removed from campus for the remainder of the Work.

Additional information regarding the tobacco free campus policy is located at:
<http://umaine.edu/tobaccofree/>

- B. Sexual Harassment will not be tolerated on the campuses of the University of Maine System.
- C. Weapons and Ammunition are not permitted on the campuses of the University of Maine System.
- D. Contractor will be required to provide a site-specific Safety Plan for the project.
- E. Contractor parking will be limited to authorized areas defined by the University of Maine System Representative.

PART 2 to 3 – Not Used

END OF SECTION 01 14 00

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specifications sections apply to work of this section.

1.2 SUMMARY

This Section specifies administrative and procedural requirements for Alternates.

- A. **Definition:** An alternate is an amount proposed by Bidders and stated on the Bid Form that will be added to the Base Bid amount if the Owner decides to accept a corresponding change in either scope of work or in products, materials, equipment, systems, or installation methods described in Contract Documents.
- B. **Coordination:** Coordinate related work and modify or adjust adjacent work as required to ensure that work affected by each accepted alternate is complete and fully integrated into the project.
- C. **Notification:** Immediately following award of Contract, prepare and distribute to each party involved, notification of the status of each alternate. Indicate whether alternates have been accepted, rejected or deferred for consideration at a later date. Include a complete description of negotiated modifications to alternates, if any.
- D. **Schedule:** A "Schedule of Alternates" is included at the end of this section. Specification sections referenced in the Schedule contain requirements for materials and methods necessary to achieve the work described under each alternate.
 - 1. Include as part of each alternate, miscellaneous devices, appurtenances, and similar items incidental to or required for a complete installation whether or not mentioned as part of the alternate.

PART 2 – PRODUCTS NOT APPLICABLE.

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Contractors shall hold open the prices of the Alternate Items for 30 days after the date of signing the Contract so that they may be added to the work of the Contract at the price bid by means of a Change Order within that time.
- B. List of Alternates:
 - Alternate No. 1:** a. Provide and install gravel base in lieu of concrete slab at workshop area below pavilion (refer to site typical gravel base detail).
 - b. See Drawing Sheet B1A.

- Alternate No. 2: a. Provide and install curtain fabric and hardware to complete rolling curtain system as specified in Alternate Window Schedule.
b. See Drawing Sheet B1A.

- Alternate No. 3: a. Provide and install ERV-1 and ductwork associated, including electrical, ductwork, lighting, and attic trusses, etc. to complete the work.
b. See Drawing Sheets M1A, M2A, M3A, E1A, E2A, FP1A.

C. Alternate dollar amount values (add or deduct) to be listed on Bid form.

PRODUCT SUBSTITUTION PROCEDURES**PART 1 - GENERAL****1.1 SUBSTITUTIONS**

- A. “Equivalent”, “Or Equal”, or “Substitute” products will be allowed.
- B. Substitute products should not be ordered or installed until receipt of approved shop drawing submittal from the Engineer. Contractor assumes all risks associated with premature ordering and installation of substitute products.
- C. The specifically named manufacturers, products, systems, and descriptive characteristics used in the Contract Documents normally serve only to establish a level of quality and a performance standard. Unless specific restriction is placed upon an item in the specifications, Contractor may submit proposals for substitutions. Contractor assumes risks associated with possible rejection of proposals for substitution submitted during the life of the contract.
- D. Delays caused by tardiness of Contractor in preparing and forwarding submittals do not constitute an acceptable basis for consideration of substitute products. Delays due to factors which were in effect prior to project bidding do not constitute an acceptable basis for consideration of substitute products.
- E. When making requests for substitutions, Contractor assumes the following responsibilities:
 - 1. To have personally investigated the proposed substitute product and determined it is equal or superior in all respects to that specified;
 - 2. To provide the same warranty for substitute that Contractor would for that specified;
 - 3. To provide complete cost data, and waive all claims for additional costs related to substitution which subsequently become apparent; and
 - 4. To coordinate installation of accepted substitute, making such changes as may be required for Work to be complete in all respects.
- F. In no way shall designation of a specific product limit equal substitution, except in the rare case that an Owner demands. In these rare cases the product will be identified, followed by “NO SUBSTITUTIONS”. These special cases are typically utilized for compatibility, ongoing maintenance reasons, or to maintain owner standards.

PART 2 – PRODUCTS Not used.

PART 3 - EXECUTION Not used.

SECTION 01 29 00
PAYMENT PROCEDURES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. The forms for application for payment, duly notarized, shall be the current authorized edition of the AIA Document G702, Application for Payment, supported by a current authorized edition of AIA G703, Continuation Sheet. Samples of these, and other required AIA documents, are provided in the Contract Documents under Division 00 for informational purposes only.

1.03 DEFINITIONS

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

1.04 SCHEDULE OF VALUES

- A. Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - c. Contractor's Construction Schedule.
 - 2. Submit the Schedule of Values to Architect prior to the pre-construction meeting.
- B. Format and Content: Use the specification table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Contractor's name and address.
 - d. Date of submittal.
 - 2. Submit draft of AIA G702 Application for Payment form and AIA G703 Continuation Sheet (Schedule of Values) form.
 - 3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers).
 - g. Dollar value.
 - 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Specification table of contents. Provide several line items for principal subcontract amounts, where appropriate.

- a. For each line item, provide a sublist breakdown as follows:
 - 1) Material.
 - 2) Labor.
5. Documentation: Submit proper documentation for the amounts being requisitioned from subcontractors and material suppliers with each Application for Payment. Three (3) copies of an Application for Payment or a Payment Requisition are required for all subcontracted work. Three (3) copies of the invoice is required for each major supplier.
6. Stored Materials: If Contractor is requesting payment for stored materials as part of the Application for Payment, Contractor must complete Column F in the G703 Continuation Sheet (Schedule of Values) to record the stored materials amounts against line items that pertain to those stored materials. Stored materials are materials or equipment purchased or fabricated and stored, but not yet installed or incorporated into the Work.
 - a. Complete and provide three (3) copies of 00 62 79 Stored Materials form with all required documentation. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
 - b. Only major long lead delivery items may be considered for off-site storage (example: long lead custom mechanical unit). Standard order and production materials and products shall be delivered to the site before including in Application for Payment of such items.
7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place shall be shown as separate line items in the Schedule of Values.
9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when approved Change Orders or Construction Change Directives result in a change in the Contract Sum.
10. Retainage: The required five percent (5%) retainage held per Application for Payment submission shall be accounted for on the G703 on a per line item basis. Each line item with a value in Column G "Total Completed and Stored To Date" shall have a corresponding five percent retainage value entered in Column I.
 - a. Final Release of Retainage: The final release of retainage shall be entered as a separate line item on the G703 as "Final Release of Retainage" with the full amount of the five percent retainage entered as a negative number in Column I. The final release of retainage request is submitted as a separate application.

1.05 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: G702 Application for Payment shall be submitted to Architect and Owner not less than seven (7) days before monthly progress meeting. The period covered by each Application for Payment is one (1) month, ending on the last day of the month.
- C. Payment Application Forms: The Contractor is required under the Contract Documents to use official original AIA documents. Samples of the required documents are provided in Division 00 of the Specifications.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.

2. Include amounts of approved Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal:
1. Submit signed and notarized original of:
 - a. AIA G702 Application & Certificate for Payment.
 - b. AIA G703 Continuation Sheet.
 - c. AIA G706 Contractor's Affidavit of Payment of Debts & Claims.
 - d. AIA G706A Contractor's Affidavit of Release of Liens.
 - e. 00 65 19.17 Waiver of Lien.
 2. Transmit each Application for Payment with a transmittal form listing attachments and recording appropriate information about submission.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit three (3) copies of waivers of mechanic's lien from subcontractors, sub-subcontractors, major suppliers, and every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit final waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit 00 65 19.17 Waiver of Lien forms, executed in a manner acceptable to Owner.
- G. Certified Payrolls: Wages paid to all workers performing work on the Project shall be in accordance with the Section 00 73 64 Wage Determination Schedule for the Project. Contractor shall submit one (1) copy of each weekly certified payroll for Contractor and all subcontractors, sub-subcontractors, sub-sub-subcontractors, etc. performing work on the Project during the time covered by the Application for Payment. The certified payroll shall be completed in accordance with Section 3.4.4 of the A201 General Conditions and contain the following information:
1. Contractor name.
 2. Contractor address.
 3. Period number.
 4. Week ending date.
 5. Employee(s)'s name.
 6. Employee(s)'s job title.
 7. Employee hourly wage:
 - a. Straight time rate.
 - b. Overtime rate.
 8. Hours worked per day (broken down by straight time and overtime hours).
 9. Hours worked per week (broken down by straight time and overtime hours).
 10. Total earned for the week:
 - a. Straight time.
 - b. Overtime.
 11. Benefits that form a part of the wage rate.
 12. The signature and name of the authorized payroll person.
- H. Initial Application for Payment: Administrative actions and submittals that must precede submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of Values.

3. Contractor's Construction Schedule.
 4. Submittals Schedule.
 5. List of Contractor's staff assignments.
 6. List of Contractor's principal consultants.
 7. Copies of building permits and other required permits.
 8. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 9. Initial progress report.
 10. Report of preconstruction conference.
 11. Insurance verification through submission of insurance certificates, for all Subcontractors.
- I. Progress Applications for Payment: Administrative actions and submittals that must precede or coincide with submittal of progress Applications for Payment include the following:
1. Contractor's Construction Schedule update.
 2. Submittals for Work being requisitioned that are complete and approved.
 3. Submission of list of completed tests, checklists, commissioning, reports, and similar requirements for the work that are submitted and in compliance with the Contract Documents.
 4. Distribution of minutes of previous month's progress meeting.
 5. Current record drawings.
- J. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion, less retainage, for portion of the Work claimed as substantially complete. Application must:
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. Reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- K. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited to, the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that fees and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA G707 Consent of Surety to Final Payment, three (3) originals.
 5. Evidence that claims have been settled.
 6. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 7. Final, liquidated damages settlement statement, if a liquidated damages claim has been processed.
 8. As-built drawings.
 9. Operation and maintenance manuals.
 10. Final lien waivers.
 11. All training and equipment testing is complete.

PART 2 to 3 – Not Used

END OF SECTION 01 29 00

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittal procedures.
- B. Proposed products list.
- C. Shop drawings and product data.
- D. Manufacturers' instructions.
- E. Manufacturers' certificates.

1.02 SUBMITTAL PROCEDURES

- A. Identify Project, Contractor, Subcontractor or Supplier, pertinent Drawing sheet and detail number(s), and Specification Section number, as appropriate.
- B. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.
- C. Schedule submittals to expedite the Project, and deliver to Architect/Engineer at business address. Coordinate submission of related items.
- D. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- E. Revise and resubmit submittals when changes occur; identify all changes made since previous submittal.
- F. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.03 PROPOSED PRODUCTS LIST

- A. Submit complete list of major products proposed for use, with name of manufacturer and trade name of each product.

1.04 SHOP DRAWINGS AND PRODUCT DATA

- A. Submit electronic PDFs of all submittals organized with cover sheet and contractor's review of submittal, which will be reviewed by Architect/Engineer.

1.05 MANUFACTURERS' INSTRUCTIONS

- A. Submit manufacturers' printed instructions for delivery, storage, assembly, installation, and finishing. Submit in electronic format (PDF).
- B. Identify conflicts between manufacturers' instructions and Contract Documents.

1.06 MANUFACTURERS' CERTIFICATES

- A. When specified in individual Specification Sections, submit manufacturers' certificates to Architect/Engineer for review, in quantities specified for Product Data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect/Engineer.

1.07 SCHEDULE

- A. Within ten (10) days after signing the Contract, the Contractor shall submit a schedule in either bar chart or CPM format, sufficiently detailed so that actual progress may be easily compared with scheduled progress.

PART 2 to 3 – Not Used

END OF SECTION 01 33 00

SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Administrative provisions for Substantial Completion and for final acceptance.

1.02 SUBSTANTIAL COMPLETION

- A. When Contractor considers work, or designated portion of work, is substantially complete, submit written notice with list of items to be completed or corrected.
- B. Should Owner inspection find work is not substantially complete, Owner will promptly notify Contractor in writing, listing observed deficiencies.
- C. Contractor shall remedy deficiencies and send a second written notice of substantial completion.
- D. When Owner finds work is substantially complete, Owner will prepare a Certificate of Substantial Completion in accordance with provisions of the General Conditions.

1.03 FINAL COMPLETION

- A. When Contractor considers work is complete, submit written certification that:
 - 1. Contract Documents have been reviewed.
 - 2. Work has been inspected for compliance with Contract Documents.
 - 3. Work has been completed in accordance with Contract Documents and deficiencies listed with Certificate of Substantial Completion have been corrected.
 - 4. Equipment and systems have been tested, adjusted and balanced and are fully operational.
 - 5. Operation of systems has been demonstrated to Owner's personnel.
 - 6. Work is complete and ready for final inspection.
- B. Should Owner inspection find work incomplete, Owner will promptly notify Contractor in writing, listing observed deficiencies.
- C. Contractor shall remedy deficiencies and send a second certification of final completion.
- D. When Owner finds work is complete, Owner will consider closeout submittals.

1.04 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
- B. Warranties and bonds. Submit originals and in PDF format.
- C. Spare parts and maintenance Materials.
- D. Evidence of payment and Releases of Lien.

1.05 APPLICATION FOR FINAL PAYMENT

- A. Submit application for final payment in accordance with provisions of Conditions of the Contract.

1.06 GUARANTEE

- A. Neither the final requisition for payment nor any provision in the Contract Documents nor partial or entire use or occupancy of the building by the Owner shall constitute an acceptance of work done in accordance with the Contract Documents or relieve the Contractor of liability in respect to express warranties or responsibility for faulty materials or workmanship. The Contractor shall remedy any defects in the work and pay for any damage to other work resulting therefrom which shall appear within one year from the date of final acceptance unless a longer period is specified. The Owner will give notice of observed defects with reasonable promptness.
- B. Although subcontractors shall, throughout these Specifications, be required to provide guarantees for their respective work, the Contractor, in the last analysis, shall be responsible for all work and the guarantee thereof. In the case of disputes between subcontractors as to fault of problems, it is up to the Contractor to resolve these disputes or accept the cost of repair or replacement himself.

PART 2 to 3 – Not Used

END OF SECTION 01 77 00

SECTION 03 30 00
CAST -IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 **RELATED DOCUMENTS**

- A. The drawings and general conditions of the contract including General and Supplementary Conditions and other Division 1 Specification sections apply to work of this section.
- B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 **DESCRIPTION OF WORK**

- A. Work included: Provide labor, materials, and equipment necessary to complete the work of this Section and, without limiting the generality thereof, furnish and include the following:
 - 1. The extent of cast-in-place concrete work as shown on drawings and includes (but not by way of limitation) formwork, reinforcing, cast-in-place concrete, accessories, finishing, and casting in of items specified under other Sections of the Specifications or furnished by Owner that are required to be built-in with the concrete.
 - 2. Equipment support pads indicated on mechanical drawings to be installed by the Building Contractor.
 - 3. Cast-in-place retaining walls, exterior slabs on grade and other concrete shown on site drawings.

1.3 **RELATED WORK**

- A. Structural Precast Concrete.
- B. Metal Fabrications.
 - 1. Expansion Anchors.
 - 2. Embedded Items.
- C. Anchor Bolts.
- D. Joint Sealants.

1.4 **QUALITY ASSURANCE**

- A. Codes and Standards: Comply with provisions of the latest edition of the following except where more stringent requirements are shown or specified:
 - 1. ACI "Manual of Concrete Practice".
 - 2. ACI 117 "Standard Specifications for Tolerances for Concrete Construction and Materials".
 - 3. ACI 211.1 "Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete."
 - 4. ACI 212.3R "Chemical Admixtures for Concrete."
 - 5. ACI 301 "Specifications for Structural Concrete for Buildings."
 - 6. ACI 302.1R "Guide for Concrete Floor and Slab Construction."
 - 7. ACI 304R "Guide for Measuring, Mixing, Transporting and Placing Concrete."

8. ACI 304.2R "Placing Concrete by Pumping Methods."
9. ACI 306 R "Cold Weather Concreting."
10. ACI 308 "Standard Practice for Curing Concrete."
11. ACI 309R "Guide for Consolidation of Concrete."
12. ACI 315 "ACI Detailing Manual."
13. ACI 318 "Building Code Requirements for Reinforced Concrete."
14. ACI 347R "Guide to Formwork for Concrete."
15. Concrete Reinforcing Steel Institute, "Placing Reinforcing Bars."
16. ATSC "Code of Standard Practice for Steel Buildings and Bridges."
17. "Code of Federal Regulations, Part 1926" per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).

- B. Materials and installed work may require testing and retesting, as directed by the Engineer, at any time during progress of work. Allow free access to material stockpiles and facilities. Tests not specifically indicated to be done at Owner's expense, including retesting of rejected materials and installed work, shall be done at Contractor's expense.

1.5 SUBMITTALS:

- A. Unless otherwise specified, submittals required in this section shall be submitted for review. Submittals shall be prepared and submitted in accordance with Division 1.
- B. Contractor shall submit a Submittal Schedule to the engineer within 30 days after they have received the Owner's Notice to Proceed.
- C. All submittals shall be reviewed and returned to the Engineer within 10 working days.
- D. Incomplete submittals will not be reviewed.
- E. Submittals not reviewed by the Contractor prior to submission to the Engineer will not be reviewed. Include on the submittal statement or stamp of approval by Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in this Section and Division 1 have been complied with.
- F. Engineer will review submittals a maximum of two review cycles as part of their normal services. If submittals are incomplete or otherwise unacceptable and re-submitted, Contractor shall compensate Engineer for additional review cycles.
- G. Product Data: Submit producer's or manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
 1. Reinforcement certified mill reports covering chemical and physical properties and yield strength.
 2. Patching products.
 3. Non-shrink grout.
 4. Curing compounds, where applicable.
 5. Admixtures.
 6. Expansion/Adhesive Anchors.
- H. Shop Drawings:
 1. Shop Drawing Preparation: Electronic files of structural drawings will not be provided to the contractor for preparation of shop drawings. Submit shop drawings for fabrication, bending and placement of concrete reinforcement. Comply with ACI 315, showing bar schedules, stirrup, and tie spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required at openings through concrete

elements. Include supplemental reinforcing and bar supports necessary to support reinforcing steel at proper location within forms or slabs.

- a. Review of the shop drawings will be made for the size and arrangement of reinforcement. Conformance of the Shop Drawings to the Contract Drawings remains the responsibility of the Contractor. Engineer's review in no way relieves the Contractor of this responsibility. Submit one print and one reproducible. Print will be reviewed and a reproducible will be returned to Contractor for printing and distribution. Multiple copies will not be marked by Engineer.
 - b. Shop drawings will not be reviewed as partial submittals. A complete submittal shall be provided all items listed prior. Incomplete submittals will not be reviewed.
- I. Mix designs: Submit all laboratory test reports and materials for each mix design listed within. Prepare mixes by the field experience method and/or trial mixtures per the requirements of chapter 5 of ACI 318. Include the calculation of average strength and standard deviation. Proportioning by water cement ratio method will not be permitted.
 - J. Samples: Submit samples of materials as specified and as otherwise requested by Engineer, including names, sources, and descriptions.
 - K. Curing Methods: Submit documentation of curing methods to be used for review. Account for anticipated project temperature ranges and conditions in curing methods.
 - L. Contraction/Construction Joints: Submit plan indicating proposed location of contraction and construction joints in walls and slabs.
 - M. Test Reports: Test reports shall be submitted to the Owner and Engineer within 48 hours after completion of each test.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.
 1. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled, and edge-sealed, with piece bearing legible inspection trademark.
- B. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
- C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Welded Wire Fabric: ASTM A 185 welded steel wire fabric. Provide welded wire fabric in flat sheets.

- C. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use plastic, wire bar type supports or concrete block supports complying with CRSI recommendations, unless otherwise specified. Wood, clay brick and other unspecified devices are not acceptable.
 - 1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class I) or stainless steel protected (CRSI, Class 2).

2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type 11, unless otherwise approved Use one brand of cement throughout project, -unless otherwise acceptable to Engineer.
- B. Normal Weight Aggregates: ASTM C 33. Provide from a single source for exposed concrete. Do not use aggregates containing soluble salts or other substances such as iron sulfides, pyrite, marcasite, or ochre which can cause stains on exposed concrete surfaces.
- C. Light Weight Aggregates: ASTM C 330.
- D. Water: Potable.
- E. Air-Entraining Admixture: ASTM C 260.
- F. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C 494, Type F or Type G containing not more than 1% chloride ions.
 - 1. Fiber reinforcing shall be added and distributed prior to incorporation of Super Plasticizer.
- G. Normal range water reducing admixture: ASTM C 494 Type A containing no calcium chloride.
- H. Accelerating Admixture: ASTM C 494, Type C or E.
- I. Blast Furnace Slag: ASTM 0989
- J. Fly Ash: ASTM C618, Class C or F
- K. Calcium Chloride is not permitted.

2.4 RELATED MATERIALS

- A. Underslab Vapor Barrier: Provide water-resistant barrier consisting of high density, polyolefin membrane meeting the following specifications for all slabs on ground scheduled to receive floor coverings:
 - 1. Water Vapor Transmission: 0.006 gr./sq.ft./hr. per ASTM E96.
 - 2. Permeance Rating: 0.01 gr./sq.ft./hr. per ASTM E96.
 - 3. Puncture Resistance: 204 lbs./sq.ft. per GRI-GS-1-86.
 - 4. Tensile Strength: 54.2 lbs. @ 1139% strain/MD and 55.5 lbs. @ 1009% strain/CMD per ASTM D638.
 - 5. Tear Resistance: 7.40 lbs./ft. MD and 8.22 lbs./ft. CMD per ASTM D1004.
 - 6. Low Temperature Brittleness: Pass both machine direction and cross machine direction per ASTM D1790 (15 min. @ 15 deg F.)

7. Meets to ASTM E 1745, Class A and B standards for underslab vapor retarders in contact with earth.
 8. Material manufactured with ISO certified virgin resins.
 9. Product: Subject to compliance with requirements, provide Stego Wrap by Stego Industries, LLC, 15-foot-wide roll, 10-mil thick vapor retarder. (877) 464-7834.
 10. Accessories:
 - a. Tape: High-density polyethylene tape with pressure sensitive adhesive. Minimum 4-inch width.
 - b. Pipe Boot: Construct boots from vapor barrier material and high-density polyethylene tape per manufacturer's instruction.
 11. Installation: Install vapor barrier per manufacturer's instructions. Provide vapor barriers for all slabs receiving floor coverings.
 - a. Granular base shall be level and properly rolled or tamped, ready to receive vapor barrier.
 - b. Place vapor barrier with the longest dimension parallel with the direction of the pour.
 - c. Lap vapor barrier over footings and seal to foundation walls.
 - d. Lap joints 6 inches and seal with polyethylene tape.
 - e. Seal pipe penetrations with pipe boot made from vapor barrier and tape.
 - f. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches, and taping all four sides with polyethylene tape.
- B. Non-Shrink Cement-based Grout: Provide grout consisting of pre-measured, prepackaged materials supplied by the manufacturer requiring only the addition of water. Manufacturer's instructions must be printed on the outside of each bag.
1. Non-shrink: No shrinkage (0.0%) and a maximum 4.0% expansion when tested in accordance with ASTM C-827. No shrinkage (0.0%) and a maximum of 0.2% expansion in the hardened state when tested in accordance with CRD-C-621.
 2. Compressive strength: A minimum 28-day compressive strength of 5000 psi when tested in accordance with ASTM C-109.
 3. Setting time: A minimum initial set time of 60 minutes when tested in accordance with ASTM C-191.
 4. Composition: Shall not contain metallic particles or expansive cement.
- C. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M182, Class 2.
- D. Moisture-Retaining Cover: One of the following, complying with ANSI/ASTM C 171.
1. Waterproof paper.
 2. Polyethylene film.
 3. Polyethylene-coated burlap.
- E. Liquid Membrane-Forming Curing Compound: Liquid type membrane forming curing compound complying with ASTM C 309, Type I, Class A unless other type acceptable to Engineer. Curing compound shall not impair bonding of any material, including floor finishes, to be applied directly to the concrete. Demonstrate the non-impairment prior to use.
- F. Preformed Expansion Joint Formers:
1. Bituminous Fiber Type, ASTM D 1751.
 2. Felt Void, Poly-Styrene Cap with removable top as manufactured by SUPERIOR.
- G. Slab Joint Filler: Multi-component polyurethane sealant (self-leveling type).
- H. Waterstops shall be Bentonite/Butyl Rubber based product. Use in conjunction with manufacturer's approved mastic. Acceptable products include:
1. "Waterstop-Rx," by American Colloid Co.

2. "Adeka Ultra Seal MC-2010," by Asahi Denka Kogyo, Kik MN.

2.5 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 318. Use material, including all admixtures, proposed for use on the project. If trial batch method used, use an independent testing facility acceptable to Engineer for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing unless otherwise acceptable to Engineer.
- B. Submit written reports to Engineer of each proposed mix for each class of concrete. Do not begin concrete production until mixes have been reviewed by Engineer.
- C. Proportion design mixes to provide concrete with the following properties:
 1. Footings and foundation walls
 - a. Strength: 3500 psi at 28 days.
 - b. Aggregate: 3/4"
 - c. W/C Ratio: 0.54 maximum
 - d. Entrained Air: 6% +/- 1.5%
 - e. Slump: 4" maximum
 2. Interior Slabs on grade:
 - a. Strength: 3500 psi at 28 days
 - b. Aggregate: 3/4" minimum, 1 1/2" maximum.
 - c. W/C Ratio: 0.54 maximum
 - d. Entrained Air only (no entrainment), 2% maximum
 - e. Slump: 4" maximum
 3. Exterior Slabs and all other exposed Site Concrete not specified elsewhere:
 - a. Strength: 4500 psi at 28 days
 - b. Aggregate: 3/4"
 - c. W/C Ratio: 0.45 maximum
 - d. Entrained Air: 6% +/- 1.5%
 - e. Slump: 4" maximum
 4. Add air entraining admixture at manufacturers prescribed rate to result in concrete at point of placement having the above noted air contents.
 5. Additional slump may be achieved by the addition of a mid-range or high-range water reducing admixture. Maximum slump after the addition of admixture shall be 6 or 8 inches for mid-range or high range water reducing admixtures, respectively.
- D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor, when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, at no additional cost to Owner and as accepted by Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Structural Engineer before using in work.
 1. Water may be added at the project only if the maximum specified slump and design mix maximum water/cement ratio is not exceeded.
 2. Additional dosages of superplasticizer should be used when delays occur and required slump has not been maintained. A maximum of two additional dosages will be permitted per ACI 212.3R recommendations.

2.6 CONCRETE MIXING

- A. Job-Site Mixing will not be permitted.

- B. Ready-Mix Concrete: Must comply with the requirements of ASTM C 94, and as herein specified. Provide batch ticket for each batch discharged and used in work, indicating project name, mix type, mix time, and quantity.
1. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required by Structural Engineer.
 2. When the air temperature is between 85 degrees F. and 90 degrees F., reduce the mixing and delivery time from 1 1/2 hours to 75 minutes, and when the air temperature is above 90 degrees F., reduces the mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMS:

- A. Design, erect, support, brace, and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position.
- B. Design, construct, erect, maintain, and remove forms for cast-in-place concrete work in compliance with ACI 347.
- C. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.
- D. Construct forms to sizes, shapes, lines, and dimensions shown, and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like to prevent swelling and for easy removal.
- F. Provide temporary openings where interior area of formwork is inaccessible for clean out, for inspection before concrete placement and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.
- G. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- H. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection, and to prevent spoiling concrete surfaces upon removal.
 1. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is 1" inside concrete and will not leave holes larger than 1" diameter in concrete surface.
- I. Provision for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

- J. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retighten forms and bracing after concrete placement as required to eliminate mortar leaks and maintain proper alignment.

3.2 PLACING REINFORCEMENT

- A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.
 - 1. Subgrade tolerance shall conform to a tolerance of $\pm 1\frac{1}{2}"$. Base tolerance (fine grading) for slabs shall conform to a tolerance of $\pm \frac{3}{4}"$ in. Confirm compliance of above tolerances with surveyed measurements taken at 20 ft. intervals in each direction.
 - 2. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
 - 3. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.
 - 4. Place reinforcement to obtain specified coverage for concrete protection within tolerances of ACI-318. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
 - 5. Install welded wire fabric in flat sheets in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.3 JOINTS

- A. Construction Joints: Locate and install construction joints, which are not shown on drawings, so as not to impair strength and appearance of the structure, as acceptable to Engineer. Submit plan indicating proposed location of construction joints for review prior to beginning work.
 - 1. Provide keyways at least $1\frac{1}{2}"$ deep in construction joints in walls, and slabs; bulkheads reviewed by the Engineer, designed for this purpose may be used for slabs.
 - 2. Roughened surfaces shall be used between walls and footings unless shown otherwise on the drawings. The footing surface shall be roughened to at least an amplitude of $\frac{1}{4}"$ for the width of the wall before placing the wall concrete.
 - 3. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.
 - 4. Joints in slabs on grade shall be located and detailed as indicated on the drawings. If saw-cut joints are required, the early-entry dry-cut process shall be used. Refer to ACI 302, section 8.3.12.

3.4 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto. Notify other trades to permit installation of their work. Templates to be utilized for setting of anchorage devices shall be constructed in a manner to allow mechanical consolidation of concrete. "Wet Setting" of embedded items into plastic concrete will not be permitted without special permission from the Engineer.
- B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface.

- C. Tolerances: Tolerances for Anchor Bolts/Rods, bearing surfaces and other embedded items shall meet the requirement set forth in the latest edition of the American Institute of Steel Construction "Code of Standard Practice for Steel Buildings and Bridges," and ACI 117. The more stringent criteria from these documents shall apply.

3.5 INSTALLATION OF GROUT

- A. Place grout for base plates in accordance with manufacturer's recommendations.
- B. Grout below setting plates as soon as practicable to facilitate erection of steel and prior to removal of temporary bracing and guys. If leveling bolts or shims are used for erection grout shall be installed prior to addition of any column load.
- C. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.

3.6 PREPARATION OF FORM SURFACES

- A. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.
- B. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating material manufacturer's directions. Do not allow excess form coating to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

3.7 CONCRETE PLACEMENT

- A. For topping to be placed on concrete plank, refer to specification section 03 41 00 for specific preparation requirements.
- B. Preplacement Review: Footing bottoms are subject to review by the Geotechnical Engineer. Reinforcement and all concrete preparation work shall be subject to review by the Structural Engineer. Verify that reinforcing, ducts, anchors, seats, plates, and other items cast into concrete are placed and securely held. Notify Engineer 48 hours prior to scheduled placement and obtain approval or waiver of review prior to placement. Be sure that all debris and foreign matter is removed from forms.
- C. Concrete shall be placed in the presence of an approved testing agency.
- D. General: Comply with ACI 304, and as herein specified.
 - 1. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation due to rehandling or flowing.
 - 2. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients and in a manner which will assure that the required quality of the concrete is maintained.
 - 3. Conveying equipment shall be approved and shall be of a size and design such that detectable setting of concrete shall not occur before adjacent concrete is placed. Conveying equipment shall be cleaned at the end of each operation or workday. Conveying equipment and operations shall conform to the following additional requirements:
 - a. Belt conveyors shall be horizontal or at a slope which will not cause excessive segregation or loss of ingredients. Concrete shall be protected against undue drying

- or rise in temperature. An arrangement shall be used at the discharge end to prevent apparent segregation. Mortar shall not be allowed to adhere to the return length of the belt. Long runs shall be discharged into a hopper or through a baffle.
- b. Chutes shall be metal or metal-lined and shall have a slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 feet long and chutes not meeting the slope requirements may be used provided they discharge into a hopper before distribution.
 - c. Pumping or pneumatic conveying equipment shall be of suitable kind with adequate pumping capacity. Pneumatic placement shall be controlled so that segregation is not apparent in the discharged concrete.
 - d. Concrete shall not be conveyed through pipe made of aluminum alloy. Standby equipment shall be provided on the site.
 - e. Tined rakes are prohibited as a means of conveying fiber reinforced concrete.
4. Do not use reinforcement as bases for runways for concrete conveying equipment or other construction loads.
- E. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 18 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
1. Consolidate placed concrete by mechanical vibrating equipment. Hand-spading, rodding, or tamping as the sole means for the consolidation of concrete will only be permitted with special permission from the Engineer. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.
 2. Use vibrators designed to operate with vibratory equipment submerged in concrete, maintaining a speed of not less than 8000 impulses per minute and of sufficient amplitude to consolidate the concrete effectively. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine, generally at points 18 inches maximum apart. Place vibrators to rapidly penetrate placed layer and at least 6 inches into the preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion maintain the duration of vibration for the time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix, generally from 5 to 15 seconds. A spare vibrator shall be kept on the job site during all concrete placing operation.
- F. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
1. Consolidate concrete using internal vibrators during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations. Do not sprinkle water on plastic surface.
 3. Maintain reinforcing in proper position during concrete placement operations.
 4. Slab thicknesses (slab-on-grade and plank toppings) indicated on the drawings are minimums. Provide sufficient concrete to account for structure deflection, subgrade fluctuations, and to obtain the specified slab elevation at the flatness and levelness indicated here within.
 5. Finish: See "Monolithic Slab Finishes" in this specification for slab finish requirements.
- G. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.
1. When air temperature has fallen to or is expected to fall below 40 degrees F (4 degrees

- C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F (10 degrees C), and not more than 80 degrees F (27 degrees C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators.
 4. All temporary heat, form insulation, insulated blankets, coverings, hay or other equipment and materials necessary to protect the concrete work from physical damage caused by frost freezing action, or low temperature shall be provided prior to start of placing operations.
 5. When the air temperature has fallen to or is expected to fall below 40 degrees F, provide adequate means to maintain the temperature in the area where concrete is being placed between 50 and 70 degrees F.
- H. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with AC1305 and as herein specified.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F. Mixing water may be chilled or chopped ice may be used to control the concrete temperature provided the water equivalent of the ice is calculated to the total amount of mixing water.
 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
 3. Wet forms thoroughly before placing concrete.
 4. Do not use retarding admixtures without the written acceptance by the Engineer.

3.8 FINISH OF FORMED SURFACES

- A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This concrete surface shall have texture imparted by form facing material, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 in. in height rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, damp-proofing, painting or other similar system. This as-cast concrete surface shall be obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.
- C. Grout Cleaned Finish: Provide grout cleaned finish to scheduled concrete surfaces which have received smooth form finish treatment. Combine one part Portland cement to 1-1/2 parts fine sand by volume and mix with water to consistency of thick paint. Proprietary additives may be used at Contractor's option. Blend standard Portland cement and white Portland cement, amounts determined by trial patches, so that final color of dry grout will closely match adjacent surfaces.
1. Thoroughly wet concrete surfaces and apply grout to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.
- D. Related Unformed Surfaces: At tops of walls and grade beams, horizontal offset surfaces occurring adjacent to formed surfaces, strike-off, smooth and finish with a texture matching adjacent unformed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.9 FLOOR FLATNESS AND LEVELNESS

- A. Tolerances for flatness and levelness must meet recommendation of flooring material manufacturer, and as a minimum floor flatness/levelness tolerances shall conform to the requirements set forth in ACI 117 and ACI 302 for "flat" floor profile.
 - 1. Minimum Test Area Flatness/Levelness: FF35/FL25
 - 2. Minimum Local F Number: FF35/FL25
- B. Levelness criteria shall be applied to slabs-on-grade only.
- C. Contractor shall measure floor finish within 72 hours after slab finishing and provide corrective measures for finishes not within tolerance. Corrective procedures shall be reviewed by the Engineer prior to implementation.

3.10 MONOLITHIC SLAB FINISHES

- A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds, and as otherwise indicated.
 - 1. After placing slabs, plane surface to a tolerance not exceeding $\frac{1}{8}$ " in 10 ft. when tested with a 10-ft. straightedge. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.
- B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, and as otherwise indicated.
- C. Trowel Finish: Apply trowel finish to monolithic slab surfaces indicated, including slab surfaces to be covered with carpet, resilient flooring, paint, or other thin-film finish coating system.
- D. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
- E. Slab finishes for floor coverings not indicated shall be coordinated with the Engineer prior to slab placement.
- F. Slab Joints: Where indicated, sawn slab contraction joints shall be "soft cut", immediately after concrete surface is firm enough not to be torn or damaged by the blade.

3.11 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with the requirements of ACI 306 as herein specified.
- B. Curing Methods: Perform curing of concrete by moist curing, by moisture-retaining cover curing, by curing compound, and by combinations thereof, as herein specified unless noted otherwise. Curing shall commence as soon as concrete surfaces are sufficiently hard as to withstand surface damage. Slabs-on-grade shall be cured by moist curing methods.
- C. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

- D. Protection from Mechanical Injury: During the curing period, the concrete shall be protected from damaging mechanical disturbances, such as load stresses, heavy shock, and excessive vibration. All finished concrete surfaces shall be protected from damage by construction equipment, materials, or methods, by application of curing procedures, and by rain or running water. Self-supporting structures shall not be loaded in such a way as to overstress the concrete.

3.12 REMOVAL OF FORMS

- A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as joints, slabs, and other structural elements, may not be removed in fewer than 14 days or until concrete has attained design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimen's representative of concrete location or members.
- C. Form facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and support.

3.13 REUSE OF FORMS

- A. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and latency, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Engineer.

3.14 MISCELLANEOUS CONCRETE ITEMS

- A. Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

3.15 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to the Engineer.
1. Cut out honeycomb, rock pockets, and voids over 1/4 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.
 2. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

- B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Engineer. Surface defects, as such, include color and texture irregularities, cracks, spans, air bubbles, honeycomb, rock pockets, fins, and other projections on surface and stains and other discolorations that cannot be removed by cleaning.

3.16 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. Testing Agency, employed by the Contractor, shall verify reinforcement, including foundation reinforcement and slab reinforcement (WWF or reinforcing bar). Agent shall verify WWF or reinforcement has been chair/placed with proper clearances.
- B. The Contractor shall employ a Testing Laboratory to inspect, sample and test the materials and the production of concrete and to submit test reports. Concrete testing shall be performed by technicians certified by the Maine Concrete Technician Certification Board and/or ACI Concrete Field-Testing Technician Grade I.
- C. Concrete shall be sampled and tested for quality control during placement. Quality control testing shall include the following, unless otherwise directed by the Engineer.
- D. See Submittals section for report requirements.
- E. Sampling Fresh Concrete: ASTM C 172.
 - 1. Slump: ASTM C143; one test for each concrete load at point of discharge and one test for each set of compressive strength test specimens. Sample shall be taken from middle third of the load per ASTM 0172. A slump test must be run prior to the incorporation of the CFP fibers per recommendations of ACI 544. A slump test must be run prior to and following the addition of a water reducer (super plasticizer) per recommendations of ACI 301.
 - 2. Air Content: ASTM C231 "Pressure method for normal weight concrete." One test for each concrete load, measured at point of discharge and one test for each set of compressive strength specimens.
 - 3. Concrete Temperature: Per ASTM C-1064; one test for each load and one test each time a set of compression test specimens are made.
 - 4. Compression Test Specimen: ASTM C31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
 - a. An insulated Cure Box for specimen curing shall be supplied by Testing Agency for initial curing as defined in ACI C31.
 - b. Means of heating or cooling the Cure Box shall be provided by the Inspection Agency if required in order to maintain a temperature between 60 and 80 degrees F. Contractor shall provide an electrical source to the Testing Agency when required for temperature control.
 - c. A maximum-minimum thermometer shall be provided in the Cure Box by the Testing Agency to record the temperature range of the Cure Box during specimen curing. The Testing Agency shall record the maximum/minimum temperature of the Cure Box when transferring the specimens to the laboratory.
 - d. Test Specimens shall be moist cured.
 - e. Refer to ACI C31 for additional requirements for Test Specimens.
 - 5. Compressive Strength Tests: ASTM C39; one set for each 50 cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 4,000 sq. ft. of surface area placed; 1 specimen tested at 7 days, 2 specimens tested at 28 days, 1 specimen retained in reserve for later testing if required.
 - 6. Pumped concrete shall be tested at point of discharge per ACI 301.
- F. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in

the structure, as directed by the Engineer. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods, as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

SECTION 05 12 00
STRUCTURAL STEEL

PART 1 - GENERAL

1.1 **RELATED DOCUMENTS**

- A. The drawings and general conditions of the contract including General and Supplementary Conditions and other Division 1 Specification sections apply to work of this section.
- B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 **DESCRIPTION OF WORK**

- A. Extent of structural steel work is shown on drawings, including schedules.
- B. Structural steel is that work defined in AISC "Code of Standard Practice" and as otherwise shown on drawings.

1.3 **RELATED WORK**

Section 03 30 00 Cast-In-Place Concrete and Section 05 50 00 – Metal Fabrications.

1.4 **QUALITY ASSURANCE**

- A. **Codes and Standards:** Comply with provisions of the following, except as otherwise indicated:
 - 1. AISC "Code of Standard Practice for Steel Buildings and Bridges – March 7, 2000".
 - 2. AISC "Specifications for Structural Steel Buildings – Allowable Stress Design and Plastic Design," June 1, 1989, including "Commentary" and Supplements issued thereto.
 - 3. AISC "*Specifications for Structural Joints using ASTM A 325 or A 490 Bolts*" approved by the Research Council on Structural Connections of the Engineering Foundation.
 - 4. AISC "*Seismic Provisions for Steel buildings.*"
 - 5. AWS D1.1 – 2004 "Structural Welding Code" – Steel.
 - 6. AWS D1.3 – 2004 "Structural Welding Code" – Sheet Steel.
 - 7. ASTM A6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".
 - 8. "Code of Federal Regulations, Part 1926" per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).
- B. **Qualifications for Welding Work:** Quality welding processes and welding operators in accordance with AWS D1.1 "Standard Qualification Procedure."
 - 1. Provide certification that welders to be employed in work have satisfactorily passed AWS D1.1 qualification tests and maintained a current certification. Current certification and/or continuity log shall be submitted and be available in the field.
 - 2. If re-certification of welders is required, retesting will be the Contractor's responsibility.
- B. **Fabricator Qualifications:** Fabricator must be a member of the American Institute of Steel Construction (AISC), be certified for SBD – Conventional Steel Building Structures, STD –

Standard for Steel Building Structures. Fabricator shall be certified at time of bidding and for duration of project

1.5 SUBMITTALS

- A. Unless otherwise specified, submittals required in this section shall be submitted for review. Submittals shall be prepared and submitted in accordance with this section and Division 1.
- B. Incomplete submittals will not be reviewed.
- C. Submittals not reviewed by the General Contractor prior to submission to the Engineer will not be reviewed. Include on the submittal a statement or stamp of approval by the Contractor, representing that the Contractor has seen and examined the submittal and that all requirements listed in Division 1 have been complied with.
- D. Engineer will review submittals a maximum of two review cycles as part of their normal services. If submittals are incomplete or otherwise unacceptable and re-submitted, General Contractor shall compensate Engineer for additional review cycles.
- E. Produce Data: Submit producer's or manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
 - 1. Structural steel certified mill reports for each grade of steel covering chemical and physical properties and yield strengths.
 - 2. High-strength bolts (each type), including nuts and washers.
 - 3. Structural steel primer paint (where applicable).
 - 4. Structural steel topcoat paint (where applicable).
 - 5. AWS D1.1 Welder certifications.
 - 6. Expansion/Adhesive Anchors (coordinate with Section 03300).
- F. Fabricator's Quality Control Procedures: Fabricator shall submit their written procedural and quality control manuals, and evidence of periodic auditing of fabrication practices by an approved inspection agency.
- G. Fabricator's Certificate of Compliance: At completion of fabrication, fabricator shall submit a Certificate of Compliance stating that the work was performed in accordance with the construction documents.
- H. Shop Drawings
 - 1. Shop Drawing Review. Electronic files of structural drawings will not be provided to the contractor for preparation of shop drawings.
 - a. Review of the shop drawings will be made for the size and arrangement of the members and strength of the connections. Conformance of the Shop Drawings to the Contract Drawings remains the responsibility of the General Contractor. Engineer's review in no way relieves the General Contractor of this responsibility. Submit one print and one reproducible. Print will be reviewed, and a reproducible will be returned to Contractor for printing and distribution. Multiple copies will not be marked by Engineer.
 - b. Shop drawing will not be reviewed as partial submittals. A complete submittal shall be provided and shall include erection and piece drawings indicating all members, braced frames, moment frames and connections. Incomplete submittals will not be reviewed.

2. Connection Design: Submit design calculations prepared and stamped by a Professional Engineer registered in the State of Maine for all beam and column connections not tabulated in the AISC “Manual of Steel Construction” (ASD or LRFD). Submit design for all building braced frames and moment frames where applicable, as indicated on design drawings:
 - a. Fabricator and Erector are responsible to provide connections that meet the requirements of AISC standards. All shop and field welds, bolts, plates, and miscellaneous components required to provide complete connection assemblies shall be provided.
 - b. Simple shear connections shall be provided for the full uniform load capacity of the beam for non-composite construction, and 1.5 times the full uniform load capacity of the beam for composite construction. All connections shall have a minimum of 2 bolts, and non connection capacity shall be less than 10 kips (unfactored).
 - c. Braced frame connections: A brace force has been provided on the drawings. See drawings for additional requirements. Braced frame connections shall be designed in such a manner that the connection does not induce a moment on the beam or column.
 - d. Column splices (where applicable) shall be designed and detailed per AISC standards. Column splices at braced frames and/or moment frames shall develop the full capacity of upper section or meet the requirements of the AISC Seismic Provisions, Latest Edition (whichever requirement is more stringent).
 - e. Moment connections shall be designed for the full moment capacity of the beam. Bolted moment connections shall not reduce the flange area of the beam by more than 15 percent.
3. Test Reports: Submit copies of reports of tests conducted on shop and field bolted and welded connections. Include data on type(s) of test conducted and test results.

1.6 DELIVERY, STORAGE AND HANDLING:

- A. Deliver materials to the site at such intervals to ensure uninterrupted progress of work.
- B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place, in ample time to not delay work.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off the ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
- D. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Steel materials shall be stored in a manner to avoid ponding of precipitation on members. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Structural Steel Shapes, Plates and Bars: ASTM A 36 minimum, higher strength steel is acceptable.
- B. Structural Steel Hot Rolled Wide Flange Shapes: ASTM A 992 Grade 50 (ASTM A572 Grade 50 with special requirements per AISC Technical Bulletin #3, dated March 1997).
- C. Steel Tube: ASTM A 500, Grade B, $F_y = 46$ ksi.
- D. Steel Pipe: ASTM A 53, Grade B.

- E. Anchor Bolts: ASTM F1554, Grade 36 weldable steel, unless noted otherwise on drawings. Anchor rods that are to be exposed to weather, located in unheated enclosures, or in contact with pressure treated lumber shall be hot dipped galvanized.
- F. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular low-carbon steel bolts and nuts. Provide hexagonal heads and nuts for all connections.
- G. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
 - 1. Quenched and tempered medium-carbon steel bolts, nuts, and washers, complying with ASTM A325 or ASTM A490. Refer to drawings for diameters.
 - 2. Direct tension indicator washers or bolts may be used at Contractor's option.
 - 3. Provide hot-dipped galvanized fasteners at locations where steel is hot dipped galvanized.
- H. Steel Shear Studs: Headed type manufactured from steel conforming to ASTM A108 Grade C1015. Refer to Drawings for diameter and length.
- I. Electrodes for Welding: E70XX and comply with AWS Codes with proper rod to produce optimum weld joint considering material, weld position and size of joint. All filler metal used for complete penetration groove welds shall have a minimum Charpy V Notch value of 20 ft-lbs. at 40°F for enclosed and heated structures and 20 ft-lbs. at 0°F for all other structures. Electrodes shall be compatible with steel of both connected elements.
- J. Steel Coatings for Exterior Exposed Steel: Except where indicated to be primed and painted, Hot Dipped Galvanized per ASTM A123/A123M (latest edition). Galvanizing shall be applied in a manner to provide Class C faying surfaces for slip critical connections. See Structural Steel Coatings section for additional requirements for galvanizing and painting.
- K. Non-Shrink Cement-Based Grout: See Section 03300.
- L. Drilled Anchors: Expansion and adhesive by HILTI, SIMPSON or POWER/RAWL as indicated on the Drawings.

2.2 FABRICATION

- A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings.
 - 1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
 - 2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burns and other defects.
- B. Connections: Weld or bolt shop connections, as indicated.
 - 1. Provide field bolted connections, except where welded connections or other connections are indicated.
 - 2. Provide high-strength threaded fasteners for principal bolted connections, except where unfinished bolts are indicated.
- C. High-Strength Bolted Connection: Install high-strength threaded fasteners in accordance with AISC "Specification for Structural Joints using ASTM A 325 or A 490 Bolts". Unless

otherwise indicated, all bolted connections are to be tightened to the snug tight condition as defined by AISC.

- D. Welded Construction: Comply with AWS Codes for procedures, appearance and quality of welds, and methods used in correcting welding work.
- E. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings.
- F. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.
- G. Camber, if any, is indicated on the drawings. Camber indicated is the required camber at time of erection. Contractor shall survey camber prior to placing metal deck.

2.3 STRUCTURAL STEEL COATINGS

- A. To the greatest extent possible, structural steel coatings shall be shop applied.
- B. Galvanizing, priming, and painting for structural steel permanently exposed to view shall meet the requirements of Section 10 of the Code of Standard Practice, "Architecturally Exposed Structural Steel".
- C. Provide venting/drainage holes in sealed tubular members to be hot-dipped galvanized. Holes shall be provided in a location hidden from view in the final condition and in a manner that will not reduce the strength of the member. Hole locations shall be clearly indicated on the Shop Drawings and are subject to review of the Engineer.
- D. General: Shop priming and/or topcoat are required only for steel permanently exposed to weather and/or view, unheated steel, or as otherwise indicated on the drawings and herewith.
- E. Steel which is to receive spray-on fireproofing shall not be primed or painted, unless specified by the Engineer.
- F. Coatings: The following guidelines are provided for structural steel coatings. Final coating locations are to be coordinated by the Contractor with the Engineer on the structural steel fabrication drawings.
 - 1. The following structural steel elements shall be PRIMED ONLY, with the fabricator's standard rust inhibitive alkyd primer, Tnemec Series 10 Substitution shall be equal to the above specified products and shall be submitted for review.
 - a. Unheated structural steel to be enclosed with architectural finishes, including all canopy members.
 - b. Touch-up prime any damage to primer in the field, including primer removed for field welding.
 - 2. The following structural steel elements shall be hot-dipped galvanized, unless noted otherwise on the drawings.
 - a. Structural steel elements exposed to the weather and exterior, including loose lintels, roof screen steel, and mechanical equipment dunnages.
 - b. All steel embedded in or supporting brick masonry and/or exposed to weather and not architecturally enclosed as referenced above.
 - c. Repair any damaged galvanizing with cold Galvanizing Compound by ZRC. Cold galvanizing compound is not a substitute for Hot-Dipped Galvanizing and shall only be used as a repaired coating.

3. Steel Embedded in Concrete/Below Grade: Steel, which is embedded in concrete, below grade/slab level, or otherwise indicated on the drawings, shall be field painted with TNEMEC FIBRETAR No. 250 Coal Tar Epoxy. Paint embedded areas only. Do not paint surfaces which are to be welded until welding is complete.

G. Application:

1. Surface Preparation: After inspection and before shipping, clean steel work to be painted or galvanized. Remove loose mill scale, splatter, slag, or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) SP-2, or SP-3, "Hand Tool Cleaning" for alkyd primer, and SP-6, "Commercial Blast Cleaning", for zinc rich primer or hot dipped galvanizing, unless shown otherwise on drawings.
2. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions. Apply primer at a rate to provide dry film thickness given in manufacturer's specification. Use painting methods which result in full coverage of joints, corners, edges, and exposed surfaces. Following proper cure times and temperatures, apply topcoat in accordance with manufacturer's instruction, at a rate to provide dry film thickness specified by manufacturer.

PART 3 - EXECUTION

3.1 ERECTION

- A. General: Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
- B. Erection Procedures: Comply with "Code of Federal Regulations, Part 1926" per the Occupational Safety and Health Administration (OSHA), Department of Labor (Latest Revision).
- C. Surveys: Employ a Registered Land Surveyor for elevations of concrete bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Structural Engineer. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been approved any Structural Engineer of Record. Additional surveys required to verify out-of-alignment work and/or corrective work shall be performed at the contractor's expense.
- D. Temporary Shoring and Bracing: This is the sole responsibility of the Contractor. Provide temporary shoring and bracing members with connections of sufficient strength to support imposed loads. Remove temporary members and connections when all permanent members are in place, and all final connections are made, including the floor and roof diaphragms. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds. Comply with OSHA Standard referenced previously. Retain the services of a Specialty Structure Engineer (Not the Engineer of Record) to design specialty shoring and bracing.
- E. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.
 1. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
 2. Welding to anchor bolts for corrective measures is strictly prohibited without prior written approval from the Engineer.

F. Setting Plates and Base Plates:

1. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations. Refer to Division 3 of the project Specifications for anchor bolt installation requirements in concrete.
2. Clean concrete bearing surfaces of bond-reducing materials. Clean bottom surface of setting and bearing plates.
3. Set loose and attached base plates for structural members on wedges or other adjusting devices.
4. Pack non-shrink grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.

G. Concrete slabs that are part of elevated floor framing systems shall achieve 28-day design strength prior to the application of any superimposed loads such as curtain walls, masonry veneer, mechanical equipment, and stairs. Additional testing beyond that specified in Division 3 required to verify the concrete strength prior to application of superimposed loads shall be done at the Contractor's expense.

H. When installing expansion bolts or adhesive anchors, the Contractor shall take measures to avoid drilling or cutting any existing reinforcement or damaging adjacent concrete. Holes shall be blown clean with compressed air and/or cleaned per manufacturer's recommendations prior to the installation of anchors.

I. Field Assembly

1. Set structural frames accurately to lines and elevations indicated.
2. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly.
3. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
4. Splice members only where indicated and accepted on shop drawings.
5. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

J. Coat columns, base plates, and brace elements encased in concrete and/or below grade with coal tar epoxy. Coordinate coating with concrete work.

K. Erection bolts: Remove erection bolts. On exposed welded construction, fill holes with plug welds and grind smooth at exposed surface.

L. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members which are not under stress, as accepted by the Engineer of Record. Finish gas-cut sections equal to a sheared appearance when permitted.

M. Coating Damage: Touch-up shop applied paint or galvanizing whenever damaged or bare. Clean surface and touch-up with shop primer noted and topcoat, as required.

N. Welders shall have current evidence of passing and maintaining the AWS D1.1 Qualifications test available in the field.

O. Welding electrodes, welding process, minimum preheat and interpass temperatures shall be in accordance with AISC and AWS specifications. Any structural steel damaged in welding shall be replaced.

- P. Field Welded Moment Connections: Backing materials for top and bottom flanges for field welded moment connections shall be removed, backgouge the weld root, and apply a reinforcing fillet weld. Where top flange steel backing materials are utilized, the backing may be left in place and shall be welded with a continuous fillet.

3.2 QUALITY CONTROL

- A. General: Contractor is responsible for maintaining quality control in the field and for providing a structure that is in strict compliance with the Contract Documents.
1. Required inspection and testing services are intended to assist the Contractor in complying with the Contract Documents. These specified services; however, do not relieve the Contractor of his responsibility for compliance, nor are they intended to limit the Contractor's quality control efforts in the field.
- B. Testing: Contractor shall engage an Independent Testing Agency to inspect all high-strength bolted and welded connections, to perform tests and prepare reports of their findings. All connections must pass these inspections prior to the installation of subsequent work which they support.
1. Testing agency shall conduct tests and state in each report which specific connections were examined or tested, whether the connections comply with requirements, and specifically state any deviations therefrom.
 2. Contractor shall provide access for testing agency to places where structural steel work is being fabricated, produced, or erected so that required inspection and testing can be accomplished. Testing agency may inspect structural steel at plant before shipment. The Engineer, however, reserves the right, at any time before final acceptance, to reject material not complying with specified requirements.
- C. Inspection Requirements (to be performed by the Independent Testing Agency):
1. Bolted Connections: Inspect all bolted connections in accordance with procedures outlined in the AISC "Specifications for Structural Joints using ASTM A325 or A490 Bolts".
 2. Snug Tight Bolted Connections:
 - a. The inspector shall monitor the installation of bolts to determine that all plies of connected material have been drawn together and that the selected procedure is used to tighten all bolts.
 - b. If the inspector does not monitor the installation of bolts, he shall visually inspect the connection to determine that all plies of connected material have been drawn together and conduct tests on a sampling connection bolts to determine if they have been tightened to the snug tight condition. The test sample shall consist of 10% of the bolts in the connection, but not less than two bolts, selected at random. If more than 10% of the tested bolts fail the initial inspection, the Engineer reserves the right to increase the number of bolts tested.
 3. Space, adjust, and align joists accurately in location before permanently fastening.
 - a. The inspector shall monitor the calibration of torquing equipment and the installation of bolts to determine that all plies of connected material have been drawn together and that the selected procedure is used to tighten all bolts.
 - b. If the inspector does not monitor the calibration or installation procedures, he shall test all bolts in the affected connection using a manual torque wrench to assure that the required pretension has been reached.
 4. Field Welded Connections: Inspect and test during fabrication of structural steel assemblies, and during erection of structural steel all welded connections in accordance with procedures outlined in AWS D1.1. Record types and location of defects found in work. Record work required and performed to correct deficiencies.

- a. Certify welders and conduct inspections and tests as required. Submit welder certifications to Engineer of Record. Perform visual inspection of all welds. Primary and secondary welds, including fillet welds, full penetration welds, and deck puddle welds, applied in the field and/or shop shall be visually inspected.
 - b. Welds deemed questionable by visual inspection shall receive non-destructive testing. In addition, all partial and full penetration welds, and any other welds indicated on the drawings are to receive non-destructive testing. Non-destructive testing methods include the following:
 - 1. Radiographic Inspection: ASTM E94 and ASTM E 142, minimum quality level "2-2T".
 - 2. Ultrasonic Inspection: ASTM E 164.
 - c. All welds deemed unacceptable shall be repaired and retested at the Contractor's expense.
- D. Testing and inspection reports shall be submitted to the Owner, Architect and Engineer within 48 hours of completion of each test or inspection.
- E. Nonconforming Work: Contractor shall be responsible for correcting deficiencies in structural steel work which inspections laboratory test reports have indicated to be not in compliance with requirements. Additional tests and/or surveys shall be performed, at the Contractor's expense, as may be necessary to show compliance of corrected work. Any costs associated with the Engineer's review and disposition of faulty work shall be borne by the Contractor.

CARPENTRY**PART 1 - GENERAL****1.1 DESCRIPTION**

Work Included: provide and install, unless otherwise indicated below, all carpentry and millwork required for a complete and finished project, to include but not be limited to, the following:

- A. All wood framing, blocking, and furring.
- B. All millwork, trim, and other finish woodwork.

1.2 QUALITY ASSURANCE

Provide sufficient workers and supervisors who shall be present at all times during execution of this portion of the Work, and who shall be thoroughly familiar with the type of construction involved and the materials and techniques specified.

1.3 PRODUCT HANDLING**A. Protection:**

1. Store all materials in such a manner as to ensure proper ventilation and drainage, and to protect against damage and the weather.
2. Keep all materials clearly identified with all grade marks legible. Keep all damaged material clearly identified as damaged, and store separately to prevent its inadvertent use.
3. Do not allow installation of damaged or otherwise non-complying material.
4. Use all means necessary to protect the installed work and materials of all other trades.

B. Replacements:

In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS**2.1 WOOD**

- A. General: All lumbers and plywood shall bear grade and trademarks under whose rules it is produced and a mark of mill identification. All lumber shall be kiln dried. Finished lumbers shall not exceed 12%; framing lumbers shall not exceed 18%. All lumber shall be free of stains, animal life, blemishes, be sound, well manufactured, and free of warp within limits of grading rules. All lumbers shall be dressed finish.
- B. Rough Carpentry: Use Red Pine, Eastern Spruce, Norway Pine, or Douglas Fir.
 1. For beams, headers, rafters, and joists, use lumber with minimum bending stress of 1,200 psi and modulus of elasticity 1,400,000 psi, or as noted otherwise.
 2. For studs, sills, plates, and blocking, use construction grade lumber, unless noted otherwise.

C. Finish Carpentry:

1. For exterior trim, casing, etc., use Northern White Pine, 2 or better.
2. For interior trim, casing, etc., use Northern White Pine, 1 or better.

D. MDO: plywood shall be B-B Grade, APA Rated Medium Density Overlay.

E. Fire rated: plywood shall be 30-minute FRTW AWPAC-27 Interior Type A.

F. Softwood Plywood: PS 1, (U.S. Product Standard), Standard Sheathing Grade, Group 1, Appearance Quality (without filler pockets); face veneers sanded.

G. Hardwood Plywood: Interior for painted shelving: Birch, sanded, paint grade (Grade II-II) both sides where exposed both sides, Grade II-IV where exposed one side only.

H. Pressure Treated Lumber:

1. All wood called to be pressure treated shall be ACQ arsenic free lumber.
2. Site-applied waterproofing treatments are not acceptable.

I. Manufactured Wood Beams: Sized as noted on the plans and equal to 2.0E Microllam LVL as produced by Trus Joist MacMillan, Boise, Idaho.

2.2 FASTENING PRODUCTS

Use non-corrosive nails, screws, bolts, anchors, and similar items of type and sizes sufficient to draw and secure members in place. For nailing all siding materials use deformed shank nails ONLY.

2.3 OTHER MATERIALS

All other materials, including materials and lumber provided by owner shall be acceptable and subject to approval, unless Engineer's inspection in the field finds items not to be satisfactory. Contractor shall be responsible to verify all lumber materials installed are 18% or less for moisture content prior to installation of interior finishes. Materials not specifically described but required for a complete and operable installation of the work of this Section, shall be new, first quality of their respective kinds, and subject to the approval of the Engineer.

PART 3 - EXECUTION

3.1 INSPECTION

Examine the areas and conditions where work will be performed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 WORKMANSHIP

A. General: All carpentry shall produce joints true, tight, and well nailed, with all members assembled in accordance with the Drawings and with all pertinent Codes and Regulations.

B. Selection of Lumber Pieces:

1. Carefully select all members. Select individual pieces so that knots and obvious defects will not interfere with placing bolts, proper nailing, or making connections.

2. Cut out and discard all defects that will render a piece unable to serve its intended function. Lumber may be rejected by the Engineer, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.

3.3 GENERAL FRAMING

A. General:

1. In addition to all framing operations normal to fabrication and erection indicated on the Drawings, install all backing required for work of other trades.
2. Set all horizontal or sloped members with crown up.
3. Do not notch, bore, or cut members for pipes, ducts, conduits, or other reasons except as shown on the Drawings or as specifically approved in advance by the Engineer.

B. Bearings:

1. Make all bearings full unless otherwise indicated on the Drawings.
2. Finish all bearing surfaces on which structural members are to rest so as to give sure and even support. Where framing members slope, cut or notch the ends as required to give uniform bearing surface.

3.4 STUD WALLS AND PARTITIONS

A. Studs: Make all studs single length, unspliced, and platform framed, unless indicated otherwise on the Drawings.

B. Corners and Intersections: Unless otherwise indicated on the Drawings, frame all corners and intersections with three or more studs and all required bearing for wall finish.

3.5 ALIGNMENT

On all framing members to receive a finished wall or ceiling, align the finish subsurface to vary not more than 1/8 inch from the plane of surfaces of adjacent framing and furring members.

3.6 INSTALLATION OF PLYWOOD SHEATHING

A. Placement:

1. Place all plywood with face grain perpendicular to supports and continuously over at least two supports, except where otherwise specifically indicated on the Drawings.
2. Center joints accurately over supports. Unless otherwise specifically shown on the Drawings, stagger the end joints of plywood panels to achieve a minimum of continuity of joints.
3. For roof sheathing, use H-clips at unsupported edge joints.

B. Protection of plywood: Protect all plywood from moisture by use of all required waterproof coverings until the plywood has in turn been covered with the next succeeding component or finish.

3.7 FASTENING

A. Nailing:

1. Provide penetration into the piece receiving the point of not less than 1/2 the length of the nail or spike provided, however, that 16d nails may be used to connect two pieces of two-inch nominal thickness. (Plywood sub-floor 8d galvanized nails.)
2. Do all nailing without splitting wood. Pre-bore as required. Replace all split members.

B. Bolting:

1. Drill holes 1/16 inch larger in diameter than the bolts being used. Drill straight and true from one side only. Bolt threads shall not bear on wood. Use washers under head and nut where both bear on wood; use washers under all nuts.

C. Screws:

1. For lag screws and wood screws, pre-bore holes same diameter as root of thread; enlarge holes to shank diameter for length of shank. Screw, do not drive, all lag screws and wood screws.

3.8 INSTALLATION

- A. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'0" for plumb and level countertops; and with 1/16" maximum offset in flush adjoining, 1/8" maximum offsets in revealed adjoining surfaces.
- B. Scribe and cut work to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.
- C. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum lengths of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners, to produce tight fitting joints with full surface contact throughout length of joint. Use scarf joints for end-to-end joints. Make exterior joints water-resistant by careful fitting. Apply flat grain lumber with bark side exposed to weather.
- D. Anchor finish carpentry work to anchorage devices or blocking built-in or directly attached to substrates. Secure to grounds stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fasteners heads are required, use fine finishing nails for exposed nailings, countersunk and filled flush with finished surface, and matching final finish where transparent is indicated.

3.9 CLEANING UP

A. General:

1. Keep the premises in a neat, safe, and orderly condition at all times during execution of this portion of the Work, free from accumulation of sawdust cut ends, and debris.

B. Sweeping:

1. At the end of each working day, and more often, if necessary, thoroughly sweep all surfaces where refuse from this portion of the Work has settled.
2. Remove the refuse to the area of the job site set aside for its storage.
3. Upon completion of this portion of the Work, thoroughly broom clean all surfaces.

SECTION 06 10 00.1
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 **DESCRIPTION**

A. Work Included:

1. Furnish and install work as shown on the Drawings and as specified herein:
 - a. Temporary enclosures for the buildings, and other temporary items normally performed by the carpentry trade, all as required under the General Conditions and Supplementary Conditions.
 - b. All rough lumber, including wood nailers, posts, plates, blocking, strapping, and other rough lumber for the various conditions as indicated on the Drawings, including rough lumber bases for mechanical and electrical equipment, fan curbs, and plywood panels for electrical panel mountings.
 - c. Plywood sheathing in locations as indicated on the Drawings.
 - d. Rough hardware, such as nails, bolts, screws, clips, as required to install rough carpentry work, except as otherwise excluded herein.
2. Install the following items as furnished under the designated sources:
 - a. Wood casework, shelving, finish, trim, and other items of finish carpentry and millwork.
 - b. Metal doors and frames
 - c. Finish hardware for doors and frames: Finish Hardware.
 - d. Various items of miscellaneous specialty items so specified for installation hereunder.

B. Related Work Specified Elsewhere - The following related work is to be performed under the designated Sections:

1. Perimeter and under slab insulation.
2. Concrete formwork.

PART 2 - PRODUCTS

2.1 **STORAGE OF MATERIALS**

- A. Store all materials in an elevated dry location, protected by waterproof coverings. Do not store within the building until masonry, concrete, and other such wet work has been completed and allowed to dry.

2.2 **GRADING STANDARDS AND QUALITY**

A. All lumber except as otherwise specified herein shall:

1. Be new, dressed 4 sides (S4S), clean, and free from warping and other defects.
2. Conform to National Design Specification for Wood Construction (NDS) issued by the American Forest & Paper Association (ANSI/NFPA NDS-1997) for sizes, use Classifications and specifications.
3. Have moisture content not exceeding 15 percent when delivered to the project.
4. Be in accordance with the grading rules of the lumber grading agency certified by the American Lumber Standards Committee Board of Review under whose jurisdiction the species of lumber is produced. (e.g., NELMA, NLGA, WWP, etc.)

- B. Plywood and other structural wood panels shall conform to and be stamped with the American Plywood Association APA Grade trademark and meet Product Standard PS-1 and/or the Performance Rating PRP-108 for the panels specified.

2.3 LUMBER TREATMENTS

- A. Preservative Treatments - All wood blocking and nailers which will be embedded or in contact with concrete and masonry, embedded or in contact with water or soil and all nailers which will be concealed by roofing and flashing, shall be pressure preservative-treated. All cut ends of treated lumber shall be field treated after cutting:

1. Pressure Treatment

Type of Preservative: The preservative used shall be Wolman CCA Type C, or equivalent, in accordance with AWWA Standard P5 and Federal Standard TT-W-550 and shall be formulated using only the oxide forms of the chemicals.

Pressure-Treated Wood: All wood shall be pressure treated to conform to the requirements of AWWA Standard C1. In addition, for applicable end uses, the following standards shall apply.

<u>End Use</u>	<u>AWPA Standard</u>
Lumber	C2
Fence Posts	C5
Plywood	C9
Highway Construction	C14
Permanent Wood Foundation	C22
Building Poles & Posts	C23

The treating process and preservative must meet the following retention characteristics for the specified applications:

<u>Application</u>	<u>Required Retention (lb./cubic foot)</u>
	Lumber, Timbers & Plywood
Above Ground	0.25
Ground/Fresh Water Contact	0.40
Salt Water Splash	0.60
Wood Foundation	0.60
Salt Water Immersion	2.50
	Pilings and Columns
Structural Poles	0.60
Foundation/Fresh Water	0.80
Salt Water Immersion	2.50*

*In northern zone, 1.50 is allowed for round piling

- Field Treatment – All field cuts on members that provide structural support to a permanent structure shall be field treated in accordance with AWWA Standard M4.
- Certification- Each piece of treated material shall bear the Wolmanized trademark, or equivalent, and the quality mark of an ALSC-recognized agency which maintains continuous supervision, testing and inspection over the quality of the product. Quality marks shall include the following information: Identification of the inspection agency, standard to which material was treated, identification of the treating plant, retention and end use for which product is suitable. The mark shall be permanently affixed to each piece.

2.4 LUMBER AND OTHER ROUGH CARPENTRY MATERIALS

- A. Unless otherwise noted lumber, nailers, blocking, equipment bases, and other lumber of actual 1½-inches or greater thickness – Commercial Grade No. 1/No. 2 Spruce-Pine-Fir (NDS).
 - 1. Lumber supplied, to be Red Pine, SPF's, Grade #2, and Grade #1 by NELMA Certificate of Inspection..
- B. Furring and other lumber less than 1½-inches in thickness - No. 2 spruce or Douglas fir.
- C. Plywood Sheathing - APA CDX (Exposure 1), in thickness indicated on the Drawings unless otherwise noted.
- D. Plywood Panels for Electrical Panel Mountings - INT DFPA A-C, 3/4" thick unless otherwise noted.
- E. Fastenings for Lumber:
 - 1. Nailers and blocking in excess of 7/8" thick - 3/8" diameter galvanized steel anchor bolts or expansion bolts, as applicable, of sufficient length to penetrate masonry or concrete a minimum of 6", unless otherwise indicated on Drawings.
 - 2. Furring and blocking 7/8" thick or less - 5/16" diameter galvanized steel anchor bolts or expansion bolts, as applicable, or sufficient length to penetrate masonry or concrete a minimum of 6".
 - 3. Other non-specified lumber shall be secured with galvanized steel fastenings, of a type most suitable for the application. Use 12d galvanized spikes for attaching framing members to themselves, except as otherwise indicated.
 - 4. Sheathing nail spacing and size: The larger of 8d common or a nail providing penetration into the holding member of 12 times the nail diameter spaced at 6" o.c. edges and intermediate support unless otherwise noted. Provide blocking (2x4 min.) or ply-clips at all unsupported edges.

2.5 ROOF TRUSSES

- A. Shall meet loads for the location as specified in ASCE Standard ASCE/SEI 7-16 Minimum Design Loads and Associated Criteria for Building and Other Structures, and as shown on drawings. Loads shall include appropriate drift loads.
- B. Furnish manufacturers documentation and computations sealed by Professional Engineer.
- C. Pressure treated if indicated on Plans.
- D. Anchorage for roof truss bearing points- "hurricane ties" as manufactured by Simpson or Teco to resist uplift forces specified by truss manufacturers sealed computations. The minimum tie shall be a Simpson "H1" or equivalent.

PART 3 - EXECUTION

3.1 TEMPORARY BRACING

- A. Provide and maintain, until such time as permanently built into the structure, all temporary bracing for door frames, sills, and other work requiring bracing and which is not specified as being provided under other Sections of the Specifications.

3.2 PROTECTION

- A. Do such work as is necessary to cover and protect all finishes and other work from damage during construction. Provide and maintain temporary substantial wood handrails around all openings through floors such as stairways.

3.3 NAILERS AND BLOCKING

- A. Fasten nailers and blocking to concrete with specified bolts, of sufficient length to extend at least 6" into the concrete and masonry, where practicable. Space bolts not over 32" on center. Stagger lines of bolts on nailers wider than nominal 3 1/2" width. Use not less than two bolts per piece of nailer length. Counterbore nailers so that nuts and ends of bolts are recessed below top surface. Install wood shims behind nailers and blocking as required, to ensure completely true surface.

3.4 FURRING

- A. Space expansion and toggle bolts not over 12" on center; space screws and nails not over 8" on center. Counter bore furring strips where finish or trim is to fit closely, so that no part of screw or bolt projects beyond face of wood.

3.5 INTERIOR FINISH CARPENTRY

- A. Interior finish shall be set and fitted accurately and tightly nailed, bolted, secured, screwed, or glued, according to detail. Finish nails shall be of proper length, deeply setting heads with set punch for putty. Each piece shall be double face nailed not over 16" apart insofar as practicable. No finish shall be set until back painted.

3.6 INSTALLATION OF PRESSED STEEL FRAMES

- A. Erect all pressed steel frames, in accordance with the approved shop drawings and frame schedule. Anchors for frames in masonry partitions and walls will be built in by the mason.
- B. Provide rigid temporary bracing for frames, as required to ensure maintenance of positioning, and remove only after frames have been permanently anchored.

3.7 INSTALLATION OF MISCELLANEOUS SPECIALTIES

- A. Receive all such items and install in accordance with the instructions of the various manufacturers, using installation accessories furnished with the specific item.

3.8 SHEATHING

- A. Secure wall sheathing perpendicular to framing with end joints staggered 48".

3.9 FRAMING

- A. Erect wood framing members in accordance with IBC and as shown on the framing plan. Place members level and plumb. Place horizontal members crown side up. Support ends of each member with not less than 1 1/2 " of bearing on wood or metal and not less than 3" on masonry.
- B. All bearing surfaces shall be horizontal and even over the entire width of support.
- C. Fasteners shall be used in accordance with IBC. Install fasteners without splitting wood.

- D. Firestops, of 2" nominal stock shall be provided in all concealed spaces not otherwise cut off from passage of air from one space to another. Contractor shall be responsible for sealing all penetrations between walls to meet IBC and NFPA requirements.
- E. Provide pressure treated blocking around exterior door openings in stud walls.

SECTION 06 17 53
ROOF TRUSSES

PART 1 - GENERAL

1.1 **DESCRIPTION**

- A. **Work Included:** Provide trusses designed to support indicated engineered loads and to span between the indicated support points. Installation is under Section 06100. Trusses are sloped top chord and horizontal bottom chord.
- B. **Related Work Described Elsewhere:**

Carpentry - Section 06 10 00

1.2 **QUALITY ASSURANCE**

- A. **Engineering:** All design engineering shall be performed by licensed engineers and all Shop Drawings shall display the seal of an engineer licensed to practice in the State of Maine.
- B. **Assembly:** Manufacture of truss joists shall be performed by authorized agents of the system designer and supplier.
- C. **Wood and Metal Components:** Shall comply with applicable standards listed and with industry standards of the Truss Plate Institute

1.3 **PRODUCT HANDLING**

Store joists in a vertical position and protected from the weather, in a location approved by the Engineer.

PART 2 - PRODUCTS

2.1 **SLOPED CHORD TRUSSES**

Use standard roof trusses as indicated on drawings, and custom trusses as detailed, with slopes and panel points as shown. Final design of trusses is responsibility of manufacturer, under conditions stated in this Section. Components may be all wood or wood and steel combinations, subject to Shop drawing approval by the Engineer.

2.2 **DESIGN LOADS**

- A. Shall meet loads for the location as specified in ASCE Standard ASCE/SEI 7-16 Minimum Design Loads and Associated Criteria for Building and Other Structures, and as shown on drawings. Loads shall include appropriate drift loads.
- B. Furnish manufacturers documentation and computations sealed by Professional Engineer.
- C. Pressure treated if indicated on Plans.
- D. Anchorage for roof truss bearing points- "hurricane ties" as manufactured by Simpson or Teco to resist uplift forces specified by truss manufacturers sealed computations. The minimum tie shall be a Simpson "H1" or equivalent.

PART 3 - EXECUTION

3.1 VERIFICATION

Prior to proceeding with any fabrication procedures, full Shop Drawings approval must be obtained in writing from the Engineer.

3.2 ASSEMBLY

Assemble the units in the shop using procedures devised by the designer/supplier. Make whatever provisions are required for attachment of bracing and anchoring in the field.

3.3 INSTALLATION

Attach trusses to plates with a minimum of one TECO Ty-Down Jr. at each end or as shown on the drawings.

SECTION 06 83 16
FIBERGLASS REINFORCED PANELING

PART 1 - GENERAL

1.1 **SECTION INCLUDES**

- A. Fiberglass reinforced plastic (FRP) wall panels.

1.2 **RELATED REQUIREMENTS**

- A. Section 07 92 00 – Joint Sealants.

1.3 **REFERENCE STANDARDS**

- A. ASTM International (ASTM) (www.astm.org):
 - 1. ASTM D 2583 – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
 - 2. ASTM D 5319 – Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
 - 3. ASTM D 5420 – Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact).
 - 4. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. FM Global (FM) (www.fmglobal.com):
 - 1. ANSI FM Approval 4880 – Class 1 Fire Rating of Insulated Wall or Wall and Roof/Ceiling Panels, Interior Finish Materials or Coatings, and Exterior; Wall Systems.
- C. UL (www.ul.com):
 - 1. UL 2818 – GREENGUARD Certification Program For Chemical Emissions For Building Materials, Finishes And Furnishings.

1.4 **SUBMITTALS**

- A. Comply with Division 01.
- B. Product Data: Submit manufacturer's product data for each type of product required.
- C. Samples: Submit manufacturer's selection and verification samples for finish, colors, patterns, and textures.
 - 1. Submit 2 samples of each type of panel, trim, and fastener.
- D. Certificates: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.

- E. Test and Evaluation Reports: Submit reports showing compliance with specified performance characteristics and physical properties.
- F. Manufacturer's Instructions: Submit manufacturer's installation and storage instructions.
- G. Environmental Certifications: Submit certificates for GREENGUARD Indoor Air Quality and Children & Schools Certification.
- H. Manufacturer's Project References: Submit manufacturer's list of successfully completed FRP panel projects, including project name and location, name of architect, and type and quantity of FRP panels furnished.
- I. Installer's Project References: Submit installer's list of successfully completed FRP panel projects, including project name and location, name of architect, and type and quantity of FRP panels installed.

1.5 CLOSEOUT SUBMITTALS

- A. Comply with Division 01.
- B. Care and Maintenance Instructions: Submit manufacturer's care and maintenance instructions, including cleaning and repairing instructions.
- C. Warranty Documentation: Submit manufacturer's standard warranty.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Comply with Division 01.
- B. Extra Stock Materials:
 - 1. Deliver to Owner extra stock materials from same production run as products installed.
 - 2. Quantity: Furnish quantity of FRP panels equal to 5 percent of amount installed.
 - 3. Delivery, Storage, and Protection:
 - a. Comply with Owner's requirements for delivery, storage, and protection of extra stock materials.
 - b. Package extra stock materials with protective covering and include labels clearly identifying product name and manufacturer.

1.7 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Manufacturer regularly engaged, for a minimum of 10 years, in the manufacturing of FRP panels of similar type to that specified.
- B. Installer's Qualifications:
 - 1. Installer regularly engaged, for a minimum of 5 years, in installation of FRP panels of similar type to that specified.
 - 2. Employ persons trained for installation of FRP panels.
- C. Surface-Burning Characteristics: Determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction.
 - 1. Flame-Spread Index: 25, equal to or less.
 - 2. Smoke-Developed Index: 450, equal to or less.

D. Environmental Certification: GREENGUARD Certification UL 2818.

E. Mock-ups:

1. Install at Project site a mock-up using acceptable products and manufacturer-approved installation methods if required by Owner.
2. Construct mock-up at location determined by the Owner.
3. Obtain Owner approval and acceptance of finish, color, texture, pattern, trim, fasteners, and quality of installation.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Delivery Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage and Handling Requirements:

1. Store and handle materials in accordance with manufacturer's instructions.
2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
3. Store materials in clean, dry area indoors at temperature and humidity conditions in accordance with manufacturer's instructions.
4. Store materials on flat, level surface, raised above floor, with adequate support to prevent sagging.
5. Store materials out of direct sunlight.
6. Protect materials and finish during storage, handling, and installation to prevent damage.

1.9 AMBIENT CONDITIONS

A. Do Not Begin Installation Until:

1. Building is enclosed.
2. Permanent heating and cooling equipment is in operation.
3. Residual moisture from plaster, concrete, or terrazzo has dissipated.

B. During installation and within 48 hours before installation, maintain ambient temperature and relative humidity within limits required by type of FRP panel adhesive used and adhesive manufacturer's instructions.

1.10 WARRANTY

A. Warranty Period: 1 year from date of purchase.

B. Limited Warranty Period: Prorated years 2 to 10 from date of purchase.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Crane Composites, Inc. (formerly Kemlite) 23525 West Eames Street, Channahon, Illinois 60410. Toll Free 800-435-0080. Phone 815-467-8600. Fax 815-467-8666. Website www.cranecomposites.com. Email salesbp@cranecomposites.com.

- B. Substitutions proving to be equal will be considered.
- C. Single Source: Provide FRP panels and accessories from single manufacturer.

2.2 FRP PANELS

- A. Fiberglass Reinforced Plastic (FRP) Panels: Crane Composites “Glasbord CGI”.
 - 1. Class C.
 - 2. Use: Ceilings.
 - 3. Surface Finish: Pebbled embossed texture.
 - 4. Scratch Resistance, ASTM D 2583, Barcol Hardness: 60.
 - 5. Abrasion Resistance, Taber Abrasion Test, CS-17 abrasive wheels with 1,000-g weight: Weight loss after 25 cycles of no more than 0.038 percent.
 - 6. Impact Strength, ASTM D 5420: 6.3 in-lbs (0.34 J), showing no visible damage on finish side.
- B. Panel Compliance: ASTM D 5319.
- C. Panel Surface Protection: “Surfaseal” molecularly-bonded surface protection film for impact, abrasion, and scratch resistance.
- D. Panel Color by Owner.
- E. Panel Dimensions:
 - 1. Nominal Thickness: 0.12 inch
 - 2. Wall Panel Size shall be maximum to minimize joints/seams.

2.3 ACCESSORIES

- A. Moldings, Trim, and Caps: 1-piece extruded polypropylene or PVC, configured to cover panel edges and corners.
 - 1. Color for moldings, trim, caps, etc. shall be by Owner.
- B. Panel Adhesive: As recommended by FRP panel manufacturer for required substrates.
 - 1. VOC Content: Maximum 50 g/L.
- C. Panel Seam Sealant: Bright white, 2-part urethane sealant, as recommended by FRP panel manufacturer.
 - 1. VOC Content: 0.0 g/L.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive FRP panels.
- B. Examine Substrate Surfaces to Determine:
 - 1. Corners: Plumb and straight.

2. Surfaces: Smooth, sound, and uniform.
 3. Nails or Screw Fasteners: Countersunk.
 4. Joints and Cracks: Filled flush and smooth with adjoining surfaces.
- C. Notify Owner of conditions that would adversely affect installation or subsequent use.
- D. Do not begin preparation or installation until unacceptable conditions are corrected.

3.2 PREPARATION

- A. Clean substrates to remove substances that could impair bond of adhesive, including oil, grease, dirt, dust, or other contaminants.
- B. Acclimate FRP panels by unpacking and placing in installation space a minimum of 24 hours before installation.
- C. Lay out FRP panels before beginning installation.
1. Locate panel joints to provide equal panel widths at ends of walls.
 2. Locate panel joints to provide trimmed panels at corners a minimum of 12 inches wide.

3.3 INSTALLATION

- A. Install FRP panels in accordance with manufacturer's instructions at locations indicated on the Drawings.
- B. Install FRP panels plumb, level, square, flat, and in proper alignment.
- C. Install FRP panels to be water resistant and washable.
- D. Install FRP panels with manufacturer's recommended gap for panel field and corner joints.
- E. Fasteners:
1. Use fasteners in accordance with manufacturer's instructions to install FRP panels securely to supports.
 2. Pre-drill fastener holes in FRP panels, 1/8 inch greater in diameter than fasteners.
- F. Adhesive:
1. Install FRP panels in full spread of adhesive.
 2. Follow adhesive manufacturer's instructions for application of adhesive.
- G. Install trim accessories with adhesive and nails or staples.
1. Do not fasten through FRP panels.
- H. Sealant:
1. Fill grooves in trim accessories with sealant before installing FRP panels.
 2. Bed inside corner trim in bead of sealant.
 3. Remove excess sealant and smears as FRP panels are installed.
 4. Clean in accordance with sealant manufacturer's instructions.

- I. Tolerances: Install FRP panels within manufacturer's installation tolerances.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: If requested by Owner, provide manufacturer's field service consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.5 ADJUSTING

- A. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Owner.
- B. Remove and replace with new material, damaged components that cannot be successfully repaired, as determined by Owner.

3.6 CLEANING

- A. Clean FRP panels promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that could damage finish.

3.7 PROTECTION

- A. Protect installed FRP panels and finish surfaces from damage during construction.

SECTION 07 10 00
DAMP-PROOFING AND WATER-PROOFING

PART 1 - GENERAL

1.1 DESCRIPTION

Provide all labor, materials, tools, and equipment and perform all membrane waterproofing as shown on Drawings, specified herein, and required for a complete and proper installation.

1.2 QUALITY ASSURANCE

Standards: Comply with standards specified in this Section: Federal Construction Guide Specification FCGS-07111 - Department of Housing & Urban Development, HUD Release 628a.

1.3 SUBMITTALS

Manufacturer's Data: Within 10 calendar days after award of the Contract, submit:

1. Complete materials list of all items proposed to be furnished and installed under this Section.
2. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements.
3. Manufacturer's recommended installation procedures. The manufacturer's recommended installation procedures, when approved by the Engineer, will become the basis for inspecting and accepting or rejecting actual installation procedures used on the Work.

PART 2 - PRODUCTS

2.1 ROOF

Where indicated on the drawings, valleys and flashing shall be protected from ice and water damage with a self-adhering membrane of rubberized asphalt bonded to polyethylene sheeting. 40 Mil Ice and Water Shield by W.R. Grace & Co (min. 6' at all edges, valleys, etc.).

2.2 FOUNDATION

Where indicated on the drawings foundation and framing shall be protected from water with a self-adhering membrane of rubberized-asphalt bonded to polyethylene sheeting. 56 Mils Bituthene 3100 by W.R. Grace & Co.

PART 3 - EXECUTION

3.1 A ROOF – TO WALL APPLICATION (Ice and Water Shield)

- A. Cut the membrane into 4 to 6 foot lengths. Peel the release paper, center the sheet up the wall or ridge, drape and press it in place working from the center of the termination outward in each direction. For walls, apply membrane starting at the low point and working upwards. Overlap all sheets a minimum of 6 inches at ends and 3-1/2 inches on sides.
- B. The membrane should not be folded over the roof edge unless the edge is protected by a gutter, or other flashing materials.
- C. Apply Ice & Water Shield only in fair weather at air temperatures of 40°F or higher.

- D. Ice & Water Shield membrane must not be left permanently exposed to sunlight. It must be covered by shingles or other roofing materials. It must always be adhered directly to the deck.

3.2 VERTICAL WALL SURFACES (Bituthene 3100)

- A. General: The membrane, when in place, must withstand static ground water pressure.
- B. Priming: Application of primer shall be limited to what can be covered with Bituthene Waterproofing Membrane in a given work day. Primed areas not covered by membrane during the work day will be reprimed. Apply primer by spray, roller, or brush at a rate of 250-350 square feet per gallon (6-8 sq.m./L). Roller should be a natural material such as lamb's wool, having a nap of approximately one inch (2.5 cm). Primer shall be applied to a clean, dry, frost-free, and dust-free surface. Sufficient primer must be used on the dry surface to condition it to a dust-free state suitable for the application of Bituthene Waterproofing Membranes. Coverage of primer will vary due to the texture and porosity of the surface to receive the primer.
 - 1. Bituthene Primer P-3000 should not be applied below 40°F (5°C) on vertical surfaces. At temperatures below 40°F (5°C), Bituthene P-3100 Primer must be used, and it may be used up to 90°F (32°C). Allow P-3000 to dry one hour or until tack-free. Allow P-3100 to dry 30 minutes.
- C. Membrane Installation: Apply Bituthene Waterproofing Membrane vertically in sections of 8 feet in length or less. On higher walls apply two or more sections with the upper overlapping the lower by at least 2-1/2" (64 mm). Press all membrane in place with heavy hand pressure or rollers during application. Two plies of Bituthene Membrane are recommended for below grade or earth shelter applications on any wood surface.

SECTION 07 20 00
INSULATION

PART 1 - GENERAL

1.1 **GENERAL**

- A. **Work Included:** Provide insulation required for this Work including, but not necessarily limited to:
1. Batt insulation for walls
 2. Rigid insulation for walls and ceilings
 3. Rigid insulation for roof

1.2 **PRODUCT HANDLING**

- A. **Protection:** Use all means necessary to protect the materials of this Section before, during and after installation and to protect the work and materials of all other trades.
- B. **Delivery and Storage:** Deliver materials to the job site, and store in a safe dry place with all labels intact and legible at time of installation.
- C. **Replacements:** In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 **INSULATION MATERIALS**

A. **FIBERGLASS THERMAL INSULATION BLANKET**

Thermal Batt insulation shall be TimberBatt® as manufactured by Timber HP or equal. Thermal resistance "R" values of the insulation shall be not less than 3.7 per inch. Thickness shall be as shown on plans.

B. **ACOUSTIC WALL INSULATION**

Acoustic batt insulation shall be un-faced Sound Attenuation Batts as manufactured by Timber HP, or equal. Thermal resistance "R" values of the insulation shall not be less than 3.7 per inch. Thickness shall be as shown on the plans.

C. **RIGID WALL INSULATION**

Foil faced glass reinforced polyisocyanurate foam insulation. R=7.2 or better at 68°F. for a 1" thickness equal to Celotex Thermax sheathing board. See drawings for insulation thickness.

D. **FOAM SEALANT**

Provide air tank propelled urethane sealant (Polycel 1 or equal) around all exterior wall penetrations. I.E. Door and window frames, etc.

E. SPRAYED CELLULAR PLASTIC INSULATION

Sprayed Cellular Plastic Insulation shall be equal to Corbond Performance Insulation System as manufactured by Corbond Corporation, Bozeman, MT, with the following specifications:

- Thermal Conductivity: K-.15 (ASTM-C-177-85)
R-Factor = 7.3 per inch aged 90 days @ 73°F or 6.75 per inch aged 90 days @ 140°F (ASTM-C-177-85).
- Density = 1.8-1.9 pcf in place (ASTM-D-1622).
- Permeance = .80 @ 2.5-inch thickness (ASTM-E-96).
- Surface Burning Characteristics: Class 1-ASTM-E-84-91A.
Flame Spread = 25, Smoke Developed = 295.

F. FIBERGLASS BLOWN INSULATION

Blown insulation shall be fiberglass material with fire-retardant and vermin-resistant properties to form a loose mass. Provide as appropriate for configuration of space to be insulated equal to Certainteed Insul-Safe III.

Provide fiberglass insulation, tested/listed/labeled with the following ratings: ASTM E136 for non-combustibility, building standard of ASTM C764 Type 1 Category 1. Average insulation value of R-60 at 20" thick.

G. FOUNDATION INSULATION

The materials shall be extruded polystyrene rigid insulation board equal to Styrofoam SM as manufactured by the Dow Chemical Company meeting the following specifications:

HH-1-524a	Type II	Class B
MIL-P-41619	Type I	Class 2 Grade B

This material shall have a vapor permeability rating of 1.0 perm-inch or less (C355-64 ASTM) and a thermal conductivity of 0.20 or less at 75°F. (C177-63 ASTM.)

2.2 OTHER MATERIALS

All other materials, not specifically described but required for a complete and proper installation of the work of this Section, shall be as selected by the Contractor subject to the approval of the Engineer.

PART 3 - EXECUTION

3.1 INSPECTION

Examine the various locations intended for insulation installation and notify the Engineer and the installing trade of any conditions requiring correction prior to the placement of these materials.

3.2 INSTALLATION

- A. All materials in this Section shall be installed as directed by the Engineer and manufacturer's recommendations.
- B. Blanket Insulation: Install blankets to fit snugly against all wood members and adjacent blanket. Staple smart vapor barrier flange to face of studs and trusses.

- C. Friction Fit Insulation: Install batts tightly in stud space and secure with mechanical fasteners. Fasteners to be pin or wire equal to Tactoo Series T or EZ Hangers.
- D. Rigid Board Wall Insulation: Install insulation within cavity space as shown on the drawings. Care shall be taken during installation to ensure all boards are tightly butted and installed. Fabricate insulation by means of saw, knife, or other sharp tool to obtain a tight fit. Where specified to be glued, use Macco #LN601 1 liquid nails in accordance with manufacturer's instructions. Tape all joints and nail heads with aluminized adhesive back sealing tape.
- E. Sprayed Cellular Plastic Insulation: Install insulation as shown on the plans by Licensed Technicians in accordance with the manufacturer's recommendation. Certificates of Annual Training in Safety and Applications shall be required from Installers.
- F. Install "proper vent" type rigid insulation baffles on the underside of roof sheathing at eaves to maintain airflow above insulation.
- G. Blown-in Insulation: Insulation shall be full thickness in all areas. Do not install until all trades have completed their work.
- H. Perimeter Insulation: Insulation shall be held firmly in place and be attached to concrete wall with Dow Mastic II in accordance with manufacturer's instructions if required to retain the proper location.
- I. Doors & Windows: Foam seal with hose and wand application from air tank or completely fill void with fiberglass insulation around all doors and windows. Avoid excessive filling which could cause bowing of frames.

SECTION 07 27 00
WEATHER/AIR BARRIERS

PART 1 - GENERAL

1.1 **GENERAL REQUIREMENTS**

- A. The General Conditions, Supplementary Conditions, Instructions to Bidders, and Division 01- General Requirements shall be read in conjunction with and govern this Section.
- B. Read this Specification as a whole by all parties concerned. Each Section may contain more or less than the complete Work of any trade. The Contractor is solely responsible to make clear to the installing Subcontractor the extent of their Work.

1.2 **SUMMARY**

- A. This Section includes requirements for supplying labor, materials, tools, and equipment to complete the Work as shown on the Drawings Architectural Division as specified herein including, but not limited to, the following:
 - 1. Adhesive/Primer
 - 2. Self-Adhered Water Resistive Air Barrier
 - 3. Air Barrier
 - 4. Sealant

1.3 **RELATED REQUIREMENTS**

- A. DIVISION 07 – Section 07 10 00 – Dampproofing and Waterproofing
- B. DIVISION 07 – Section 07 92 00 – Joint Sealants
- C. DIVISION 08 – Section 08 50 00 – Windows

1.4 **ALTERNATES**

- A. Submit requests for alternates in accordance with Section 01 25 13, “Product Substitution Procedures.”
- B. Materials must meet the following criteria:
 - 1. Acceptance criteria for water-resistive barriers:
 - a. ICC – ES AC38: Pass
 - 2. Air leakage:
 - a. ASTM E2178: Pass
 - 3. Water resistance:
 - a. ASTM E331: Pass
 - 4. Nail Sealability:
 - a. AAMA 711: Pass
 - b. ASTM D1970: Pass
- C. Alternate submission format to include:
 - 1. Evidence that alternate materials meet or exceed performance characteristics of product requirements and documentation from an approved independent testing

laboratory certifying that the performance of the system including auxiliary components exceed the requirements of the local building code.

2. References clearly indicating that the Air Barrier Manufacturer has successfully completed projects of similar scope and nature on an annual basis for a minimum of ten (10) years.
 3. Air Barrier Manufacturer's guide specification.
 4. Air Barrier Manufacturer's complete set of technical data sheets for assembly.
 5. Air Barrier Manufacturer's complete set of details for assembly.
 6. Product certification confirming assembly components are supplied and warranted by a single source Air Barrier Manufacturer.
 7. Sample warranty as specified.
- D. Submit requests for alternates to this specification a minimum of ten (10) working days prior to bid date. Include a list of twenty-five (25) projects executed over the past five (5) years.
- E. Issued addendums confirm acceptable alternates. Do not submit substitute materials after tender closing.

1.5 REFERENCES

- A. American Architectural Manufacturers Association (AAMA):
1. AAMA 711-13 - Voluntary Specification for Self-Adhering Flashing Used for Installation of Exterior Wall Fenestration Products
- B. American Society for Testing and Materials (ASTM):
1. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting
 2. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
 3. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
 4. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials
 5. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
 6. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials
- C. International Code Council Evaluation Services (ICC-ES):
1. ICC- ES AC38 - Acceptance Criteria for Water Resistive Barriers
- D. US Green Building Council (USGBC), Leadership in Energy and Environmental Design (LEED)

1.6 ADMINISTRATIVE REQUIREMENTS

- A. Pre-installation meetings:
1. When required, and with prior notice, an Air Barrier Manufacturer representative will meet with the necessary parties at the jobsite to review and discuss project conditions as it relates to the integrity of the assembly.

1.7 SUBMITTALS

- A. Provide the following requested information in accordance with Section 01 33 00 Submittal Procedures.
- B. Action Submittals:
 - 1. Product Data:
 - a. Air Barrier Manufacturer's guide specification
 - b. Air Barrier Manufacturer's complete set of technical data sheets for assembly
 - c. Air Barrier Manufacturer's complete set of details for assembly
 - 2. Certificates:
 - a. Product certification confirming assembly components are supplied and warranted by a single source Air Barrier Manufacturer
 - 3. Tests and Evaluation Reports:
 - a. Acceptance criteria for water-resistive barriers: ICC – ES AC38
 - 4. Warranty:
 - a. Sample warranty as specified

1.8 QUALITY ASSURANCE

- A. Single Source Responsibility:
 - 1. Obtain air barrier and auxiliary materials including adhesive/primer, air barrier, flashings, and sealants from a single Air Barrier Manufacturer regularly engaged in the manufacturing and supply of the specified products.
 - 2. Verify product compliance with federal, state, and local regulations.
- B. Manufacturer Qualifications:
 - 1. Air Barrier Manufacturer shall demonstrate qualifications to supply materials of this Section by certifying the following:
 - a. Air Barrier Manufacturer must not issue warranties for terms longer than they have been manufacturing and supplying specified products for similar scope of Work.
- C. Installer Qualifications:
 - 1. Perform Work in accordance with the Air Barrier Manufacturer's published literature and as specified in this Section.
 - 2. Maintain one (1) copy of the Air Barrier Manufacturer's installation instructions on site.
 - 3. At all times during the execution of the Work allow access to site by the Air Barrier Manufacturer representative.
 - 4. If meeting with the Air Barrier Manufacturer during project construction, contact the Air Barrier Manufacturer a minimum of two weeks prior to schedule meeting.

1.9. DELIVERY, STORAGE, AND HANDLING

- A. Delivery of Materials:
 - 1. Deliver materials to the jobsite in undamaged and clearly marked containers indicating the name of the Air Barrier Manufacturer and product.
- B. Storage of Materials:
 - 1. Store materials as recommended by the Air Barrier Manufacturer and conform to applicable safety regulatory agencies. Refer to all applicable data including, but not limited to, Safety Data Sheet (SDS), Technical Data sheet (TDS), product labels, and specific instructions for personal protection.
 - 2. Keep solvents away from open flame or excessive heat.
 - 3. Store materials in original packaging.
 - 4. Protect rolls from direct sunlight until ready for use.

5. Refer to Air Barrier Manufacturer's product TDS.

C. Handling:

1. Refer to Air Barrier Manufacturer's product TDS.

1.10. SITE CONDITIONS

A. Environmental Requirements:

1. Do not perform Work during rain or inclement weather.
2. Do not perform Work on frost covered substrates or surfaces that are wet to touch.

B. Protection:

1. It is the responsibility of the installing Subcontractor to protect all surfaces not included in scope of Work from overspray including, but not limited to, windows, doors, adjacent areas, and vehicles.
2. Cap and protect exposed back-up walls against wet weather conditions during and after application of air barrier assembly.

C. Complete preparation Work prior to installing air barrier.

D. Ground all equipment during operations.

1.11. WARRANTY

A. Manufacturer's Single Source Warranty; choose from the following:

1. Product Warranty:
 - a. Manufacturer must warrant the material against product defect for a period of one (1) year from date of purchase.
2. Assembly Warranty:
 - a. Manufacturer must warrant the assembly against product defect for a period of twelve (12) years from the date of substantial completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

B. Air Barrier and auxiliary materials shall comply with the following system requirements:

1. Obtain air barrier and auxiliary materials as a single-source from the Air Barrier Manufacturer to ensure total system compatibility and integrity.
2. Acceptance Criteria for Water-Resistive Barriers:
 - a. ICC – ES AC38: Pass
3. Air leakage:
 - a. ASTM E2178: Pass
4. Water resistance:
 - a. ASTM E331: Pass
5. Nail Sealability:
 - a. AAMA 711: Pass
 - b. ASTM D1970: Pass

C. Acceptable Manufacturers:

1. Henry® Company
999 N. Sepulveda Blvd. Suite 800
El Segundo, CA 90245

2.2 MATERIALS

- D. Primary Sheet-Applied, Vapor Permeable Water Resistive Air Barrier (Basis of Design):
1. Self-adhered vapor permeable, water resistive air barrier consisting of a reinforced, modified polyolefin tri-laminate film surface and patented permeable adhesive technology with split-back poly-release film; having the following typical physical properties:
 - a. Basis of design: Henry® Blueskin® VP100 Self-Adhered Water Resistive Air Barrier
 - b. Color: Blue
 - c. Thickness: 19 mils (0.48 mm)
 - d. Water Vapor Permeance (ASTM E96): 33 perms
 - e. Air Permeance (ASTM E2178): Pass
 - f. Nail Sealability (ASTM D1970): Pass
 - g. Surface Burning Characteristics (ASTM E84):
 1. Flame Spread: Class A
 2. Smoke Development: Class A
 - h. Low Application Temperature: 40 degrees F (5 degrees C)
- E. Assembly Auxiliary Materials:
1. Adhesives/Primers:
 - a. Standard VOC adhesive:
 1. Synthetic rubber based quick setting adhesive; having the following typical physical properties:
 - a. Basis of design: Henry® Blueskin® Adhesive
 - b. Color: Blue
 - c. Maximum VOC: 450 g/L
 - d. Drying time (initial set): 30 minutes
 - e. Low Application Temperature: 10 degrees F (-12 degrees C)
 - b. Low VOC adhesive:
 1. Synthetic rubber based quick setting adhesive with low VOC content; having the following typical physical properties:
 - a. Basis of design: Henry® Blueskin® LVC Adhesive
 - b. Color: Blue
 - c. Maximum VOC: <240 g/L
 - d. Drying time (initial set): 30 minutes
 - e. Low Application Temperature: 10 degrees F (-12 degrees C)
 2. Polymer emulsion water based quick setting adhesive with low VOC content; having the following typical physical properties:
 - a. Basis of design: Henry® Aquatac™ Primer
 - b. Color: Aqua
 - c. Maximum VOC: 50 g/L
 - d. Drying time (initial set): 30 minutes
 - e. Low Application Temperature: 25 degrees F (-4 degrees C)
 - c. Aerosol spray adhesive:
 1. Quick drying spray adhesive used to prepare construction surfaces for the application of flashings; having the following typical physical properties:
 - a. Basis of design: Henry® Blueskin® Spray Prep Adhesive
 - b. Color: Clear amber
 - c. Solids by weight: 35%
 - d. Drying time (initial set): 3 minutes

- e. Low Application Temperature: -10 degrees F (-23 degrees C)
- 2. Liquid-Applied Flashing:
 - a. Moisture-curing single component elastomeric liquid-applied flashing using a highly advanced Silyl-Terminated Polyether (STPE) polymer curing to a monolithic membrane; having the following typical physical properties:
 - 1. Basis of design: Henry® Air-Bloc® LF Liquid-Applied Flashing
 - 2. Color: Blue
 - 3. Air Permeance (ASTM E2178): Pass
 - 4. Water Vapor Permeance (ASTM E96): 21.8 perms @ 25 mils
 - 5. Air Leakage of Air Barrier Assemblies (ASTM E2357): Pass
 - 6. Water Resistance (AC212/ASTM D2247): Pass
 - 7. Nail Sealability (AAMA 711): Pass
 - 8. Surface Burning Characteristics (ASTM E84):
 - a. Flame Spread: Class A
 - b. Smoke Development: Class A
 - 9. Elongation (D412): 264%
 - 10. Low Application Temperature: 20 degrees F (-7 degrees C)
- 3. Self-Adhered Flashing:
 - a. Non-Vapor Permeable Flashing:
 - 1. Non-vapor permeable, self-adhered water resistive air and vapor barrier consisting of a synthetic butyl compound integrally laminated to a white engineered polypropylene film surface; having the following typical physical properties:
 - a. Basis of design: Henry® Blueskin® Butyl Flash
 - b. Color: White
 - c. Thickness: 14 mils (0.36 mm)
 - d. Water Vapor Permeance (ASTM E96): 0.14 perms
 - e. Nail Sealability (ASTM D1970): Pass
 - f. Elongation (ASTM D412): 825% minimum
 - g. Low Application Temperature: 25 degrees F (-4 degrees C)
 - 2. Flexible non-vapor permeable, self-adhered water resistive air and vapor barrier consisting of a synthetic butyl compound integrally laminated to a creped, white engineered film; having the following typical physical properties:
 - a. Basis of design: Henry® Blueskin® Flexible Butyl Flash
 - b. Color: White
 - c. Thickness: 54 mils (1.3 mm)
 - d. Water Vapor Permeance (ASTM E96): <0.1 perms
 - e. Nail Sealability (ASTM D1970): Pass
 - f. Low Application Temperature: 10 degrees F (-12 degrees C)
 - 3. Non-vapor permeable, self-adhered water resistive air and vapor barrier consisting of an SBS rubberized asphalt compound integrally laminated to a blue engineered thermoplastic film surface; having the following typical physical properties:
 - a. Basis of design: Henry® Blueskin® WB25 Window and Door Flashing
 - b. Color: Blue
 - c. Thickness: 25 mils (.63 mm)
 - d. Water Vapor Permeance (ASTM E96): 0.05 perms
 - e. Elongation (ASTM D412-modified): 200% minimum
 - f. Low Application Temperature: 25 degrees F (-4 degrees C)
 - 4. Low temperature non-vapor permeable, self-adhered water resistive air and vapor barrier consisting of an SBS rubberized asphalt compound integrally laminated to a blue engineered thermoplastic film surface; having the following typical physical properties:

- a. Basis of Design: Henry® Blueskin® WB Window and Door Flashing Color: Blue
 - b. Thickness: 35 mils (0.9 mm)
 - c. Water Vapor Permeance (ASTM E96): 0.05 perms
 - d. Nail Sealability (ASTM D1970): Pass
 - e. Elongation (ASTM D412-modified): 200% minimum
 - f. Low Application Temperature: 10 degrees F (-12 degrees C)
 - b. Vapor Permeable Flashing:
 - 1. Self-adhered water resistive vapor permeable air barrier consisting of a reinforced modified polyolefin tri-laminate film surface and patented adhesive technology with split-back poly-release film; having the following typical physical properties:
 - a. Basis of design: Henry® Blueskin® VP100 Self-Adhered Water Resistive Air Barrier
 - b. Color: Blue
 - c. Thickness: 19 mils (0.48 mm)
 - d. Water Vapor Permeance (ASTM E96): 33 perms
 - e. Nail Sealability (ASTM D1970): Pass
 - f. Low Application Temperature: 40 degrees F (5 degrees C)
- 4. Sealants:
 - a. Building Envelope Sealant:
 - 1. Moisture cure, medium modulus polymer modified sealing compound; having the following typical physical properties:
 - a. Basis of design: Henry® 925 BES Sealant
 - b. Color: Varies
 - c. Elongation: 450 – 550%.
 - b. Termination Sealant:
 - 1. One-part high performance synthetic rubber sealant; having the following typical physical properties:
 - a. Basis of design: Henry® 212 All Purpose Crystal Clear Sealant
 - b. Color: Clear
 - c. Elongation: 200% minimum

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 - 1. Verify substrates to receive Work and surrounding adjacent surfaces are in accordance with Air Barrier Manufacturer's installation guide and as specified in this Section prior to installation of self-adhered air barrier assembly.
 - 2. Continuous substrate:
 - a. Existing substrate must be continuous and secured prior to application of air barrier.
 - b. Securely fasten sheathing panels and install flush to ensure a continuous substrate in accordance with Air Barrier Manufacturer's installation guide and as specified in this Section.
 - c. Fastener penetrations must be set flush with sheathing and fastened into solid backing.
 - d. Refer to Air Barrier Manufacturer's details.
 - 3. Strike masonry joints flush.
 - 4. Concrete surfaces shall be smooth and without large voids, spalled areas or sharp protrusions. Refer to Air Barrier Manufacturer's details for substrate gap limitations.

5. Remove concrete forms and allow new concrete to cure for a minimum of fourteen (14) days.
 6. Curing compounds or release agents used in concrete construction must be resin based without oil, wax or pigments.
 7. Do not install air barrier over substrates that are wet to touch.
- B. Notify Contractor in writing of any conditions that are not acceptable.
- C. The installing contractor shall examine and determine that surfaces and conditions are ready to accept the Work of this Section in accordance with the Air Barrier Manufacturer's installation guide and as specified in this Section. Commencement of Work or any parts thereof shall mean installer's acceptance of the substrate.
- D. Do not apply air barrier until substrate and environmental conditions are in accordance with Air Barrier Manufacturer's installation guide and as specified in this Section.

3.2 PREPARATION

- A. All surfaces must be sound, dry, clean, and free of oil, grease, dirt, excess mortar, frost, laitance, loose and flaking particles, or other contaminants.
- B. Protect adjacent surfaces not included in scope of Work to prevent spillage and overspray.
- C. Cap and protect exposed back-up walls against wet weather conditions during and after application of the air barrier assembly.

3.3 INSTALLATION

- A. Ensure substrate is ready to receive air barrier in accordance with Air Barrier Manufacturer's installation guide and as specified in this Section.
- B. Temperature limitation:
1. Primary air barrier:
 - a. Substrate temperature must be above 20 degrees F (-7 degrees C) and rising.
 2. Auxiliary products:
 - a. Temperature limitations may vary. Refer to Air Barrier Manufacturer's product TDS for product specific temperature limitations.
- C. Application of flashing:
1. Self-adhered flashing:
 - a. Where required install adhesive/primer continuously at rate recommended by Air Barrier Manufacturer ensuring complete substrate coverage of anticipated flashing installation area.
 1. Allow adhesive/primer to cure to a tacky film prior to application of flashing.
 2. Primed areas not covered by end of day must be re-primed prior to installation of flashing.
 - b. Measure and cut self-adhered flashing to ensure adequate length to achieve continuous coverage of desired installation.
 - c. Peel protective film from self-adhered flashing and align top of membrane verifying proper positioning prior to complete film removal and flashing placement.

- d. Press self-adhered flashing firmly into place by applying hand pressure to the middle of the membrane and working the pressure to the edges; eliminating wrinkles and air bubbles.
 - e. Install self-adhered flashings in shingle fashion to eliminate reverse laps.
 - f. Where required, prime laps at rate recommended by Air Barrier Manufacturer to ensure complete coverage of anticipated lap installation.
 - g. Lap adjoining edges a minimum of two (2) inches.
 - h. Roll flashing and laps with countertop roller to obtain thorough adhesion.
 - i. Seal reverse laps at self-adhered flashing with sealant. Sealant recommendations may vary due to product or sequence of construction. Refer to Air Barrier Manufacturer details for recommended sealant.
2. Liquid-applied flashing:
- a. Apply a uniform film of aerosol spray adhesive to raw edges of gypsum sheathing at rate recommended by Air Barrier Manufacturer completely encapsulating loose gypsum core at the cut edge of gypsum sheathing.
 - b. Allow adhesive to cure to a tacky film prior to application of liquid-applied flashing.
 - c. Apply flashing in accordance with and at rate recommended by Air Barrier Manufacturer.
 - d. Spread flashing to achieve a monolithic membrane over substrate requiring flashing.
 - e. Allow flashing to cure prior to subsequent installations.

D. Detailing/Flashing:

- 1. Complete detailing and flashing installations per Air Barrier Manufacturer's installation guide, details, and this specification.
- 2. Refer to Air Barrier Manufacturer details for further clarification and installation procedures including, but not limited to, the following:
 - a. Inside corners
 - b. Outside corners
 - c. Pipe penetrations
 - d. Shelf angles
 - e. Wall to foundation transitions
 - f. Reverse laps
 - g. Construction joints
 - h. Rough openings:
 - 1. Install rough opening details per Window Manufacturer's installation guide details and in accordance with ASTM E2112.
 - 2. Wall assemblies containing a vapor retarder on the interior wall assembly:
 - a. Extend flashing into rough opening to ensure sufficient membrane for connection with vapor retarder and provide a continuous air barrier assembly.
- 3. Transitions:
 - a. Contact Air Barrier Manufacturer to coordinate transition of self-adhered air barrier to adjacent areas including, but not limited to, the following:
 - 1. Roof to air barrier
 - 2. Air barrier to vertical or horizontal waterproofing
 - 3. Fastener penetrations

E. Application of Primary Sheet-Applied Vapor Permeable Water Resistive Air Barrier:

1. Where required, install adhesive/primer continuously and at rate recommended by Air Barrier Manufacturer to ensure complete substrate coverage of anticipated flashing installation area.
 - a. Allow adhesive/primer to cure to a tacky film prior to application of air barrier.
 - b. Primed areas not covered by end of day must be re-primed prior to installation of air barrier.
2. Peel protective film from primary air barrier and align top of verifying proper positioning prior to complete film removal and placement.
3. Press primary air barrier firmly into place by applying hand pressure to the middle of the membrane and working the pressure to the edges; eliminating wrinkles and air bubbles.
4. Install primary air barrier in shingle fashion to eliminate reverse laps.
5. For lap adhesion enhancements, install standard or low VOC adhesive continuously and at rate recommended by Air Barrier Manufacturer to ensure substrate coverage of anticipated flashing installation area.
 - a. Allow adhesive/primer to cure to a tacky film prior to subsequent primary air barrier installation.
6. Horizontal applications:
 - a. Horizontal seams: two (2) inch minimum.
 - b. Vertical seams: three (3) inch minimum.
7. Roll primary air barrier and laps with countertop roller to obtain thorough adhesion.
8. Seal permanent reverse laps of primary air barrier with termination sealant.

F. Fastener Penetrations Through Primary Air Barrier:

1. It is the responsibility of the installer penetrating the air barrier assembly to install fasteners/assembly components in accordance with the Air Barrier Manufacturer's installation guide and as specified in this Section.
2. Installation requirements:
 - a. Drill fasteners/assembly components with sufficient compression to maintain continuity in the air barrier assembly.
 - b. Refer to "Self-tapping fasteners" and/or "Pre-drilled fasteners".
3. Supplemental sealant:
 - a. Penetrations that do not meet installation requirements require the addition of termination sealant at point of insertion through the air barrier to maintain continuity in the air barrier assembly.
4. Self-tapping fasteners:
 - a. Fastener head/assembly component must be larger in diameter than the fastener shank.
 - b. Install fastener head/assembly component to provide a continuous compression firmly against the air barrier creating a gasketing seal without damaging the membrane.
 - c. Do not install fastener head/assembly components through the air barrier over unsupported areas of the substrate such as sheathing joints.
 - d. Remove overdriven fasteners, improperly installed fasteners, defective/broken fasteners, or fasteners not properly fastened into the building structure beyond the air barrier membrane and seal the vacated hole with termination sealant prior to the installation of the exterior cladding.
5. Pre-drilled fastening assemblies:
 - a. Fastening head/assembly component must be larger in diameter than predrilled hole.
 - b. Install fastening head/assembly component to provide a continuous compression firmly against the air barrier creating a gasketing seal without damaging the membrane.

- c. Do not install fastening head/assembly components through air barrier over unsupported areas of the substrate such as sheathing joints.
- d. Seal improperly drilled and/or vacated holes with termination sealant prior to the installation of the exterior cladding.

3.4 FIELD QUALITY CONTROL

A. Final Observation and Verification:

- 1. Owner's representative, Builder, or Air Barrier Manufacturer shall complete the final inspection of the air barrier assembly as required by warranty.
 - a. Contact Air Barrier Manufacturer for warranty issuance requirements.

B. Install cladding as soon as practical after application. Air barrier assembly not designed for permanent UV exposure. Refer to Air Barrier Manufacturer's product TDS for product limitations.

3.5 CLEANING

- A. As the Work proceeds, and upon completion, promptly clean up and remove from the premises all rubbish and surplus materials resulting from the foregoing Work.
- B. Clean soiled surfaces, spatters, and damage caused by Work of this Section.
- C. Check area to ensure cleanliness and remove debris, equipment, and excess material from the site.

SECTION 07 41 13
METAL PANEL ROOFING SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish and install a double lock metal panel roofing system, including:
 - 1. Roofing manufacturer's requirements for the specified warranty.
 - 2. Preparation of roofing substrates.
 - 3. Wood nailers for roofing attachment.
 - 4. Insulation.
 - 5. Cover boards.
 - 6. Self-adhering underlayment.
 - 7. Metal roof edging and copings.
 - 8. Flashings.
 - 9. Other roofing-related items specified or indicated on the drawings or otherwise necessary to provide a complete roofing system.
- B. Disposal of demolition debris and construction waste is the responsibility of Contractor. Perform disposal in manner complying with all applicable federal, state, and local regulations.
- C. Comply with the published recommendations and instructions of the roofing system manufacturer, at <http://manual.fsbp.com>.
- D. Commencement of work by the Contractor shall constitute acknowledgement by the Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing system manufacturer. No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.

1.2 RELATED SECTIONS

- A. Rough Carpentry:
 - 1. Roof Sheathing: AdvanTech, minimum 3/4-inch thickness with tongue-and-grooved joints.
 - 2. Perimeter wood members for attachment of edge trim.
 - 3. Wood nailers associated with roof insulation.
- B. Sheet Metal Flashing and Trim: Formed metal flashing and trim items associated with non-metal roofing.
- C. Roof hatches and vents for installation on curbs specified in this section.

1.3 REFERENCES

- A. Referenced Standards: These standards form part of this specification only to the extent they are referenced as specification requirements.
 - 1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers; 2016.
 - 2. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2016.

3. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2008.
4. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2013.
5. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2013.
6. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2013a.
7. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; American Society for Testing and Materials; 2011.
8. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2012.
9. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference; American Society for Testing and Materials; 2005 (Reapproved 2012)
10. ASTM E1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference; American Society for Testing and Materials; 1995 (Reapproved 2011).
11. ASTM E1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems; American Society for Testing and Materials; 2011.
12. MBMA - Metal Roofing Systems Design Manual; Metal Building Manufacturers Association; 2012.
13. PS 1 - Construction and Industrial Plywood; 2009.
14. PS 20 - American Softwood Lumber Standard; 2010.
15. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.
16. UL 2218 - Standard for Impact Resistance of Prepared Roof Covering Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's data sheets on each product to be installed and manufacturer's standard detail drawings applicable to this project.
 1. Installation Instructions: Provide manufacturer's instructions to installer, marked up to show exactly how all components will be installed; where instructions allow installation options, clearly indicate which option will be used.
- B. Shop Drawings: Provide drawings prepared especially for this project for all relevant conditions, including plans and elevations, sections, and details, specified loads, flashings, roof edges, terminations, expansion joints, curbs, penetrations, and drainage. Specifically include interfaces with materials not supplied by metal roof panel manufacturer and identify each component and its finish.
- C. Pre-Installation Notice: Copy to show that manufacturer's required Pre-Installation Notice (PIN) has been accepted and approved by the manufacturer.
- D. Manufacturer's Installation Inspection Reports: Manufacturer may, at its option, inspect the installation at any time to appraise the installing contractor of their compliance with manufacturer's requirements. Typical inspections will include:
 1. Prior to the installation of the metal roofing panels to inspect the underlayments. The roofing contractor is responsible for assuring that the substrate is in suitable condition for the installation of the metal roofing components to the substrate.

2. Intermediate inspections to ensure proper installation of the metal roofing panels (if required).
3. At final completion of all metal roofing system work.
4. Submit to Engineer/Owner, for the project record, a copy of each report of inspection made.

E. Executed Warranty, by authorized company official with final closeout.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Roofing installer shall have received training from metal panel manufacturer for installation of the specified roof panel system, and:
 1. Having and using only equipment authorized and inspected by metal panel manufacturer.
- B. Pre-Installation Conference: Before start of roofing work, Contractor shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.
 1. Require attendance with all parties directly influencing the quality of roofing work or affected by the performance of roofing work.
 2. Notify Engineer well in advance of meeting.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.
- B. Exercise extreme care in unloading, storing, and installing metal panels to prevent bending, warping, twisting, and surface damage.
- C. Store products above ground on well-supported platforms that provide minimum of 1:48 slope. Store under waterproof covering or indoors and provide proper ventilation of metal components to prevent condensation build-up between metal components.

1.7 WARRANTY

- A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.
- B. Manufacturer's warranty is in addition to, and not a limitation of, other rights the owner may have under the contract documents.
- C. Warranty: McElroy Metal Warranty covering roof panels and associated metal components, roof sheathing/insulation manufactured by McElroy Metal, and accessories, covering weather tightness, finish, materials, labor, and workmanship.
 1. Limit of Liability: No dollar limitation.
 2. Scope of Coverage: Repair leaks in the roofing system caused by:
 - a. Ordinary wear and tear of the elements.
 - b. Manufacturing defect in McElroy Metal brand materials.
 - c. Defective workmanship used to install these materials.
 - d. Damage due to winds up to 90 mph.
 3. Not Covered:
 - a. Materials made by entities other than McElroy Metal.

- b. Damage due to winds in excess of 90 mph.
 - c. Damage due hurricanes or tornadoes.
 - d. Hail.
 - e. Intentional damage.
 - f. Unintentional damage due to normal rooftop inspections, maintenance, or service.
- D. Painted Finish Warranty: Provide McElroy Metal standard Red Shield non-prorated warranty covering durability of painted finish, to include film integrity, color change, fading, and chalking, unless otherwise indicated below.
- 1. Warranty Period: 25 years commencing on date of substantial completion.
 - 2. Metallic Colors (as identified by McElroy Metal): Not warranted against color change or fading.
 - 3. McElroy Metal Standard Color "Regal Red": Warranted against color change or fading for a maximum period of ten (10) years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer - Metal Roof Panels and Associated Sheet Metal Components: McElroy Metal or approved equal.
- 1. Provide all components of system supplied or specified by same manufacturer.
 - 2. Roofing systems manufactured by others may be acceptable provided the roofing system is completely equivalent in materials and warranty conditions and the manufacturer meets the following qualifications:
 - a. Specializing in manufacturing the roofing system to be provided.
 - ii. Minimum ten years of experience manufacturing the roofing system to be provided.
 - iii. Able to provide a no dollar limit, single source roof system warranty that is backed by corporate assets in excess of one billion dollars.
 - iv. ISO 9002 certified.
 - v. Able to provide waterproofing membrane underlayment.
 - vi. Able to provide polyisocyanurate insulation.
- B. Manufacturer of Insulation: Same manufacturer as metal roof panels.
- 1. Substitutions: Acceptable approved equal.

2.2 ROOFING SYSTEM DESCRIPTION

- A. Roofing System: Standing seam metal roof panels and other components, together forming a watertight assembly having the following characteristics:
- 1. Warranty: 20 year.
 - 2. Panel Seam Type: Self-locking; not requiring field seaming, concealed clip attachment to substrate.
 - 3. Panel Material: Steel, 24 gauge (0.64 mm), with fluoropolymer finish, over G90 hot-dipped galvanized coating.
 - 4. Color: Shall be approved by Owner in writing.
 - 5. Design Loads: In accordance with ASCE 7, current edition.
 - a. Design Snow Load: Not less than 80 psf (960 kPa).

- b. Maximum Deflection Under Snow Load: Not more than $L/180$ or as recommended by ASCE 7, whichever is less.
- c. Wind Uplift Resistance: Class 90 rating, minimum, when tested in accordance with UL 580.
- d. Wind Pull-Off Resistance: No failure of roof panel or fasteners when tested in accordance with ASTM E1592 for negative loading equal to negative design wind load; for assemblies not tested, capacity for gauge, span, or loading may be determined by interpolating between test values only.
- 6. Impact Resistance: Minimum of Class 4, when tested in accordance with UL 2218.
- 7. Thermal Effects: Design roof panels and their attachment to allow free movement in response to expansion and contraction forces resulting from temperature variation, as specified in the MBMA Metal Roofing Systems Design Manual.
- 8. External Fire Resistance: Class A, when tested in accordance with ASTM E108 or UL 790.
- 9. Provide all necessary members and connections, whether indicated in the manufacturer's standard detail drawings or not.
- 10. Accessories and Fasteners: Capable of resisting the specified design wind uplift forces and allowing for thermal movement of the roof panel system, not restricting free movement of the roof panel system resulting from thermal forces except at designed points of roof panel fixity.

B. Roof System Components: In order from the top down:

- 1. Metal roofing panels and trim.
- 2. Underlayment: Self-adhering, high temperature underlayment over entire roof; material as specified.
- 3. Insulation cover board.
- 4. Roof Insulation: Polyisocyanurate foam insulation board.
 - a. Thickness: 2 inches.
- 5. Cover Board: Oriented strand board or plywood, minimum 5/8 inch thick.

2.3 ROOF PANELS AND SHEET METAL FABRICATIONS

- A. Roof Panels: McElroy Metal 138t Standing Seam Roofing; roll formed roofing panels produced in a permanent factory environment with fixed-base roll-forming equipment.
 - 1. Seam Height: 1.5 inches
 - 2. Seam Spacing (Panel Width): 16 inches
 - 3. Texture: Smooth.
 - 4. Clips: As tested and supplied by manufacturer.
 - 5. Provide factory applied integral seam sealant in leg of panel.
 - 6. Form roofing panels in longest practical lengths, true to shape, accurate in size, square, and free from distribution or manufacturing defects.
- B. Steel Sheet: ASTM A653/A653M, lock-forming quality, extra smooth, tension-leveled, galvanized/galvannealed steel, minimum spangle.
- C. Fluoropolymer Coating: 70 percent full strength Kynar 500/Hylar 5000.
 - 1. Exposed Surface: 1.0 mil (0.25 mm) plus/minus 0.1 mil (0.025 mm) total dry film thickness.
 - 2. Concealed Surface: 0.2 to 0.3 mils (0.05 to 0.08 mm) total dry film thickness.
 - 3. Color: To be selected from manufacturer's standard and premium colors.

- C. Sheet Metal Components Associated with Metal Roof Panels: Made by same manufacturer and compatible with roof panels; of not less than minimum thickness required by roof panel manufacturer.
1. Fabricate trim, flashing, and accessories to roofing manufacturer's specified or approved profiles.
 2. Exposed metal components of same finish as panels.
 3. Color: Same as panels.
 4. Provide the following formed sheet metal components:
 - a. Eave.
 - b. Ridge.
 - c. Vented ridge.
 - d. Hip.
 - e. High eave.
 - f. High eave, vented.
 - g. Valleys
 - h. Rake edge.
 - i. Vertical fascia.
 - j. Sidewall flashing.
 - k. Pipe and other penetration flashings, for penetrations over 8 inches.
 - l. Flashings at interface to other roofing types.
 - m. Other flashings.
 - n. Copings, parapet covers.
 - o. Soffit panels, solid.
 - p. Soffit panels, vented.

2.4 ACCESSORY MATERIALS

- A. Self-Adhered Underlayment: Rubberized sheet waterproof membrane complying with ASTM D 1970/D1970M, self-adhering.
1. Resistance to Direct Exposure: At least 90 days.
 2. Minimum High Temperature Resistance: 230 degrees F (110 degrees C).
 3. Water Vapor Permeance: 0.1 perm (5.7 ng/ (Pa s sq m)), maximum.
 4. Acceptable Product: Clad-Gard SA or approved equal.
- B. Fasteners: In strict accordance with metal roof panel manufacturer's requirements; minimize exposed fasteners.
1. Fasteners Exposed to Weather: Sealed or with sealed washers on exterior side of covering to waterproof fastener penetration; washer material compatible with screw head; minimum 3/8-inch (9.5 mm) diameter washer for structural connections; gasket portion of fasteners or washers made of EPDM, neoprene, or other equally durable elastomeric material.
 2. Fasteners Exposed to View: Head of color matching panel or component in which installed.
- C. Installation Clips: Manufacturer standard galvanized or stainless-steel clips, as required by panel selection, for concealed securement of panels. Use only those approved for use by the roof system manufacturer.

PART 3 - INSTALLATION

3.1 GENERAL

- A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.
- B. Obtain all relevant instructions and maintain copies at project site for duration of installation period.
- C. Verify that shop drawings prepared by metal roof panel manufacturer have been approved and are available to installers; do not use drawings prepared by others for installation drawings.
- D. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptable of project conditions and requirements.
- E. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.
- F. Perform work using competent and properly equipped personnel.
- G. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.
- H. Install roofing only when surfaces are clean, dry, smooth, and free of snow or ice; do not apply roofing during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F (15 to 25 degrees C).
- I. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
 - 1. Protect from spills and overspray from bitumen, adhesives, sealants, and coatings.
 - 2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
 - 3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.
- J. Until ready for use, keep materials in their original containers as labeled by the manufacturer.
- K. Consult panel manufacturer's instructions, container labels, and Safety Data Sheets (SDS) for specific safety instructions. Keep all adhesives, sealants, primers, and cleaning materials away from all sources of ignition.

3.2 EXAMINATION

- A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment, and that deflection will not strain or rupture roof components or deform deck.

- B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.
- C. Verify that the substructure installation is in accordance with the approved shop drawings and roof panel manufacturer's requirements that the fasteners are correct for the substrate, and the substrate is installed to accommodate and support the appropriate clip spacing and attachment.
- D. Verify that installed work of other trades that such work is complete to a point where the roofing system installation may commence.
- E. Verify that roof openings, curbs, pipes, sleeves, ducts, vents, and other penetrations through roof substrate are complete and properly located.
- F. In event of discrepancy, notify Engineer in writing; do not proceed with installation until discrepancies have been resolved.

3.3 INSULATION INSTALLATION

- A. Install insulation over entire area to be roofed, mechanically fastened as required by roofing manufacturer.
- B. Provide wood nailers at all perimeters of insulation and at other locations where indicated on the drawings, of total height matching the total thickness of insulation being used.
 - 1. Install with 1/8-inch (3 mm) gap between each length and at each change of direction.
 - 2. Mechanically fasten to deck to resist force of 200 lbf per linear foot (35 kN/m).

3.4 COVER BOARD INSTALLATION

- A. Install cover board over entire area to be roofed, mechanically fastened as required by roofing manufacturer.

3.5 UNDERLAYMENT INSTALLATION

- A. Install underlayment in accordance with manufacturer's instructions.
- B. Install self-adhered underlayment over entire roofing surface.

3.6 ROOF PANEL INSTALLATION

- A. Install the metal roof panel system in accordance with the manufacturer's instructions, installation drawings, and approved shop drawings, so that it is weathertight and allows for thermal movement.
- B. Locate space and fasten all clips in accordance with roof panel manufacturer's recommendations. For required fasteners, use proper torque settings to obtain controlled uniform compression for a positive seal without rupturing the sealing washers.
- C. Panels must be locked in the field by a mechanical seamer.
- D. Do not place utility penetrations through the panel seams.
- E. Do not allow panels or trim to come into contact with dissimilar materials (i.e., copper, lead, graphite, treated lumber, mortar, etc). Protect from water run-off from these materials.

- F. Perform field cutting of panels and related sheet metal components by means of hand or electric shears. At no time shall a hot/friction saw be used.
- G. Remove protective film immediately after installation.

3.7 FLASHING AND ACCESSORIES INSTALLATION

- A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by roof panel manufacturer's recommendations and details.
- B. Install metal trim, accessories, and edgings in locations indicated on the drawings.
 - 1. Follow roofing manufacturer's instructions.
 - 2. Remove protective plastic surface film immediately before installation.
- C. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces that the roofing system abuts to; extend flashing at least 8 inches high above system surface.
- D. Flashing at Penetrations: Flash all penetrations passing through the panel; make flashing seals directly to the penetration.
 - 1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical.
 - 2. Where pre-molded pipe flashings are not practical, provide flashing detail as recommended by metal panel manufacturer.

3.8 FIELD QUALITY CONTROL

- A. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e., not a sales person).
- B. Perform all corrections necessary for issuance of warranty.

3.9 ADJUSTING AND CLEANING

- A. Repair panels having minor damage.
- B. Remove panels damaged beyond repair and replace with new panels to match adjacent undamaged panels.
- C. Clean exposed panel surfaces promptly after installation in accordance with recommendations of panel and coating manufacturers.
- D. Clean all contaminants generated by roofing work from building and surrounding areas, including adhesives, sealants, and coatings.
- E. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.
- F. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

3.10 PROTECTION

- A. Where construction traffic must continue over finished roof panels, provide durable protection, and replace or repair damaged roofing to original condition.

SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Examine all other Sections of the Specifications for requirements affecting work of this Section.

1.2 SYSTEM DESCRIPTION

System performance to achieve moisture tight joint seals.

1.3 QUALITY ASSURANCE

A. Perform Work in accordance with sealant manufacturer's requirements for preparation of surfaces and materials installation instructions.

B. Applicable standards:

1. Sealants shall comply with ANSI 116.1.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Do not install solvent curing sealants in enclosed building spaces.

B. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

PART 2 - PRODUCTS

2.1 SEALANTS

A. Sealants shall be suitable for the use intended and compatible with the materials to which they are applied and to any finish that may be applied over them. All sealants shall be gun applied.

B. Sealants, unless otherwise specified, shall be gun grade one-part sealants of the following type:

1. Polysulfide
2. Acrylic Latex
3. Polyurethane
4. Silicone Sealant
5. Non-Skinning Type Butyl Polymer

2.2 ACCESSORIES

A. PRIMER: Non-staining type, recommended by sealant manufacturer.

B. JOINT CLEANER: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. JOINT FILLER: closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width; manufactured by HBR.

- D. BOND BREAKER: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Verify that joint openings are ready to receive work, and that joint measurements and surface conditions are as recommended by the sealant manufacturer.
- B. Remove loose materials and foreign matter that may impair adhesion of sealant.
- C. Verify that joint backing and release tapes are compatible with sealant.

3.2 INSTALLATION

- A. Install sealant in accordance with manufacturer's instructions.
- B. Measure joint dimensions and size materials to achieve required width/depth ratios.
- C. Install joint filler to achieve a neck thickness dimension no greater than 1/3 the joint width.
- D. Install bond breaker where joint filler is not used.
- E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- F. Tool horizontal joints flat.

SECTION 08 25 00
DOORS, FRAMES, AND HARDWARE

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

- A. This section requires that all labor, material, equipment, and related items, necessary to furnish hollow metal (steel) doors and frames, wood doors, and finish hardware shall be considered as one subcontract.
- B. The material supplied shall meet all minimum requirements as set forth in the plans and specifications and shall include, but not be limited to furnishing and installing the following:
 - 1. Hollow metal (steel) frames for doors and interior and exterior walls glazing frames where indicated on plans, schedules, or details.
 - 2. Hollow metal (steel) doors for all openings where indicated on plans, schedules, or details.
 - 3. Finish hardware for all hollow metal (steel) doors, in accordance with hardware specifications and set numbers indicated on door schedule.

1.2 QUALITY ASSURANCE:

- A. Standards: Comply with standards specified herein as listed in these specifications.
- B. Qualifications of Manufacture: Steel doors and frames shall meet the standards of the Steel Door Institute (S.D.I. 100-69 and S.D.I. 105-69) Fire doors shall also bear the UL label for the designated rating.
- C. Door/Hardware must meet UMaine Design Criteria. Shop drawings for all Doors/Hardware must be submitted for approval.

1.3 REFERENCES:

The following references apply to requirements for this project:

- 1. NFPA 80 - Standard for Fire Doors and Windows
- 2. NFPA 101 - Life Safety Code
- 3. Hollow Metal Technical and Design Manual by NAAMM
- 4. Finish Hardware: ANSI A156
- 5. All applicable Life Safety and Building Codes

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturers' technical product data substantiating that all components of the hollow metal (steel) doors and frames, and finish hardware conform in all respects, to the requirements of the plans and Specifications.
- B. Shop Drawings: Submit for approval six sets of shop drawings and one sepia copy for hollow metal (steel) doors and frames. These shop drawings shall include individual listings and elevations of each door and frame opening, details of construction, joints, connections, label requirements, reinforcements, glazing, anchors and accessories and installation information.

- C. Finish Hardware Schedule: Submit for approval six (6) type-written copies of the finish hardware schedule. The schedule shall be in a vertical format and include the listing of doors and frames by architectural door number, location, hand, size, and type. The hardware schedule shall include complete keying information, the listing of all manufacturers whose products are scheduled therein, and all other pertinent information necessary for review and approval.
- D. Samples: If requested by the engineer, the subcontractor shall supply the following samples for approval:
 - 1. Corner sample of 18-gauge hollow metal (steel) door.
 - 2. Corner sample of 16 gauge welded hollow metal (steel) doorframe.
 - 3. Lockset with lever handle trim.
 - 4. Exit device with lever handle trim.
 - 5. Door closer with Cush-N-Stop arm.
 - 6. Full mortise hinge.

1.5 GUARANTEE

Upon delivery of the doors of this Section to the job site, and as a condition of their acceptance, deliver to the Engineer two copies of an agreement written on the door manufacturer's standard form, signed by the door manufacturer and the Contractor agreeing to replace or repair defective doors which have warped (bow, cup, or twist) or which show photographing of construction below in wood veneer faces, as defined in NWMA Standard Door Guarantees, except the NWMA provision for refunding the price received by the door manufacturer for any defective door shall not apply. The guarantee shall also include refinishing and reinstalling which may be required due to repair or replacement of defective doors. Guarantee shall be in effect for a period of five years following date of acceptance.

1.6 LABELING FOR FIRE RATED DOORS AND FRAMES:

- A. Where indicated, provide fire rated doors and frames in accordance with the requirements of NFPA 80 Fire Doors and Windows and for the rating listed on the door schedule.
- B. Doors and frames requiring a fire rating shall bear a label indicating the name of the testing agency, the hourly or alphabetical rating, and the latch bolt throw required for locksets for all fire rated doors. Labels shall be affixed to the hinge edge of hollow metal (steel) doors. Labels for frames shall be affixed to the hinge rabbet of the frame.
- C. For fire rated doors requiring exit devices, the doors shall have a second label indicating that the door has been mortised and reinforced to accept the fire rated exit device.
- D. Only labels issued by testing laboratories such as Underwriters Laboratories or Warnock Hersey having follow up service shall be considered acceptable for this project.

1.7 DELIVERY, STORAGE AND HANDLING:

- A. Doors and frames shall be delivered to the jobsite by common carrier received and stored there by the subcontractor. The general contractor shall provide storage space for set up and welded doorframes. It shall also be the general contractor's responsibility to provide enclosed covered storage space for hollow metal (steel) doors, and finish hardware. The storage space shall be a dry, secure, and lockable area, and shall not include products of other trades.
- B. All doors, frames, and hardware shall have the necessary anchors, plates, screws, bolts, and other fastenings required for accurate and correct installation.

- C. Doors, frames, locksets, exit devices, and door closers shall be clearly marked with the respective architectural door number identification shown on the engineer's door schedules.

1.8 WARRANTY:

All material specified in this section of the specifications, including hollow metal (steel), and finish hardware shall be guaranteed against defects in material and workmanship for a period of one (1) year from date of substantial completion.

- A. If any door, frame, or item of hardware is found to be defective by reasons of imperfect in material and workmanship, it shall be replaced by this subcontractor at no charge to the owner. The cost for installation of the replacement item shall be the responsibility of this subcontractor, if within the building guarantee period specified under general conditions, or by the owner if beyond the guarantee period.

1.9 APPROVAL OF SUBSTITUTIONS:

- A. Manufacturers of doors, frames, and hardware are listed herein to establish a standard of quality. If products other than those specifically identified herein are to be considered for use on this project, they must be submitted for approval by the construction manager at least ten (10) calendar days prior to receipt of bids by the construction manager.
- B. Requests for approval of substitutions shall be submitted in writing, to the engineer, and must be accompanied by catalog cuts, technical information, and physical samples.
- C. Approval for substitutions will only be valid when issued to all bidders, by the construction, in the form of an addendum to this specification.

PART 2 - PRODUCTS

2.1 HOLLOW METAL (STEEL) DOORS:

- A. Doors shall be equal to type 707 Mercury Series exterior doors and 747 Series interior doors as manufactured by Curries Manufacturing, Inc., Mason City, Iowa or approved equal. All doors shall be 18 gauge steel 1 3/4" full flush construction and reinforced, stiffened, insulated and sound deadened with a solid slab of expanded polystyrene foam permanently bonded to the inside face of each skin at Doors. Both lock and hinge stile edges shall be full flush, welded, filled, and ground smooth.
- B. The lock and hinge stiles shall be reinforced with a one piece, full height, steel channel which shall be embossed, drilled, and tapped for hinges and strike. The hinge stile reinforcing channel shall be 12 gauge steel, and the lock stile reinforcing channel shall be 14 gauge steel.
- C. Top and bottom of door shall have 16 gauge steel inverted closure channels. The top channel shall have a steel or vinyl top cap.
- D. All doors shall be beveled 1/8" in 2" at lock edge. Square edge doors shall not be considered acceptable.
- E. All doors shall be bonderized and finished with one coat of baked-on primer. Exposed galvanized finish shall not be considered acceptable.
- F. Reinforcing for door closers shall be 12 gauge steel.

- G. A certificate by the door manufacturer, verifying that the door has been tested and certified as having a maximum .24 "U" value, in accordance with ASTM C236 shall be submitted with the shop drawings. Doors with "U" values greater than .24 shall not be considered acceptable.

2.2 HOLLOW METAL (STEEL) FRAMES:

- A. Hollow metal (steel) door and window frames shall be Steelcraft FT Series or approved equal, provide 2" face and be as detailed on the drawings. Exterior steel door and window frames shall be manufactured of 16 gauge cold rolled A90 or G90 galvanized steel. Interior steel door and window frames shall be manufactured from 16 gauge cold-rolled steel.
- B. Performance Requirements: Per 2021 IECC, U-Factor of less than °.61. Air infiltration per 2021 IECC, less than °.40 CFM/ft² at 1.57 psf, ASTM E283.
- C. All frames shall be saw mitered on a high-speed metal cutting saw, corner joints shall be welded, filled, and ground smooth to a perfectly smooth surface at all exposed faces.
- D. All frames shall be thoroughly degreased and cleaned of all imperfections before painting. All frames shall be bonderized and shall receive a factory coat of baked on rust inhibitive primer. Frames with an exposed Wipe Coat Galvanized Finish shall not be considered acceptable for this project. Where welded joints at corners and mullions occur, the exposed steel shall be painted to match the prime coat finish of the frame. For galvanized frames, the exposed areas where zinc coating has been removed thru grinding shall be touched up with an approved zinc rich primer similar to ZRC or Galvacon. The zinc rich primer shall then receive a prime coat finish.
- E. Frames shall be reinforced, drilled, and tapped for all mortise hinges, locks, and lock strikes. Frames shall be reinforced only for surface applied hardware, with drilling and tapping to be done in the field by this subcontractor. The hinge reinforcement for all frames shall be 7 gauge steel. The door closer reinforcing shall be 12 gauge steel. Lock strike reinforcing shall be 14 gauge.
- F. Provide metal plaster and mortar guards for all mortise cutouts.
- G. Frames shall be set up and welded. They shall be shipped with a spreader bar welded to the base (bottom) of each frame for in transit support. Spreader bars shall be removed at the time of frame installation and replaced by a metal or wood spreader carefully dimensioned to permit square, true installation.
- H. Provide stud anchors for installation of hollow metal (steel) frames in drywall. Provide 3 jamb anchors and one base anchor for each jamb section of each frame.
- I. Frames for single doors shall have three rubber silencers on lock jamb stop. For pairs of doors, provide two rubber silencers at the head stop.
- J. Weatherstripping, thresholds, and door bottoms are specified under the finish hardware portion of this section of the specification.
- K. Hollow metal (steel) doors and frames manufactured by the following firms, meeting all requirements of this specification, shall be considered acceptable for this project.

Curries Mfg. Inc., Mason City, Iowa
Steelcraft Mfg. Company, Cincinnati, Ohio
Or approved equal.

- E. Supports and Anchors: Fabricated from not less than 0.042-inch thick (18 gage) electrolytic zinc-coated or metallic-coated steel sheet.
- F. Jamb Anchors:
 - 1. Metal Stud-Wall Type: Slip in wood stud anchor not less than 0.053 inch thick (16 gage).
- G. Floor Anchors: Formed from same material as frames, not less than 0.042 inches thick (18 gage), and as follows:
 - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
- H. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.
- I. Plaster Guards: Formed from same material as frames, not less than 0.016-inch thick (28 gage) steel sheet to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation.

2.3 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.012 inch thick (20 gage), fabricated from same material as door face sheet in which they are installed.
 - 1. Provide non-removable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
 - 2. Provide screw-applied, removable, glazing stops on inside of glass, louvers, and other panels in doors.
- B. Fixed Frame Moldings: Formed integral with steel frames, minimum 5/8 inch high, unless otherwise indicated.
- C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick (20 gage), fabricated from same material as frames in which they are installed.
- D. Astragals: As required by NFPA 80 to provide fire ratings indicated.

2.4 STEEL DOOR FABRICATION

- A. General: Fabricate steel doors and frames 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. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Steel Doors:
 - 1. Exterior Doors: For exterior locations and elsewhere as indicated, fabricate doors, panels, and frames from metallic-coated steel sheet. Close top and bottom edges of doors flush as an integral part of door construction or by addition of 0.053-inch-thick (16 gage), metallic-coated steel channels with channel webs placed even with top and bottom edges. Seal joints in top edges of doors against water penetration.
 - 2. Interior Door and Panel Faces: Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from cold-rolled steel sheet, unless otherwise indicated.
 - 3. Glazed Lites: Factory cut openings in doors.

- C. Steel Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints; fabricated from same material as doorframe. Fasten members at crossings and to jambs by butt-welding; grind smooth and invisible.
 3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners, unless otherwise indicated.
 4. Plaster Guards: Weld guards to frame at back of hardware mortises in frames installed in concrete or masonry.
 5. Where installed in masonry, leave vertical mullions in frames open at top for grouting.
 6. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor. Provide floor anchors for all frames.
 7. Jamb Anchors: 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:
 - a. Stud-Wall Type:
 - 1) Three anchors per jamb up to 60 inches in height.
 - 2) Four anchors per jamb from 60 to 90 inches in height.
 - 3) Five anchors per jamb from 90 to 96 inches in height.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof more than 96 inches in height.
 - 5) Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
 8. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Hardware Preparation: Factory prepare standard steel doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified elsewhere.
1. Reinforce doors and frames to receive non-templated mortised and surface-mounted door hardware. Through bolting will not be acceptable.
 2. Comply with applicable requirements in ANSI A250.6 and ANSI/DHI A1 15 Series specifications for door and frame preparation for hardware. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.
- E. Hardware:
1. New Construction will be coordinated by the FM Project Manager. The hardware supplier shall ship all permanent building keys and cylinders directly to the FM Locksmith Shop.
 2. Door frame hardware locations in accordance with ANSI specifications
 - a. ANSI strike plates.
 - b. Exterior door hinges: Stanley FBB 199, jeweled with non-removable pins.
 - c. Interior door hinges: Stanley FBB 179, jeweled.
 - d. Doors over 3'-0" wide, require three (3) double strength hinges. Doors over 7'-0" wide require four (4) hinges.

3. Door closer with back-check, non-handed, parallel arm, steel body. Acceptable: LCN 404XP Series.
 4. Stainless steel door handles and kickplates.
 5. Schlage ND Series locksets Grade 1 cylindrical (Rhodes Design, 626 Color), no exceptions. Or Schlage L Series locksets Grade 1 mortise (Rhodes Design, 626 Color), no exceptions. All locks shall be provided with an Everest Primus restricted keyway system, to be determined by the Owner prior to bidding. Interchangeable cores preferred.
 6. All new hardware shall be ADA compliant (i.e. lever handles in lieu of knobs).
 7. Panic hardware with handicap trim, rim devices. Acceptable:
 - a. Von Duprin Series 33 Standard
 - b. Von Duprin Series 99 fire-rated.
 8. Handicap Operator on door opener/closer. Electric only (no pneumatic).
 - a. Besam
 - b. Horton
 - c. LCN
 - d. Stanley
 9. ADA signage at these locations.
 10. Rapid entry key box (Knox Box) to be located in the vicinity of one main exterior door. Location determined by Orono Fire Department. Knox Box provided by Owner.
 11. Mechanical key override in door for all card entry system entrances.
- F. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form comers of stops and moldings with butted or mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of door or frame.
 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings such that each glazed lite is capable of being removed independently.
 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 4. Provide loose stops and moldings on inside of doors and frames.
 5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.
- G. Astragals: As required by NFPA 80 to provide fire ratings indicated.
- H. THRESHOLDS - WEATHERSTRIPPING - DOOR BOTTOMS:
1. Provide extruded or cast aluminum thresholds, as detailed on door schedule drawings. The thresholds shall be 7" and 8" wide by full width of door opening for all doors as required in the door schedule. Thresholds shall be 1/2" high and shall have beveled edges and a corrugated surface. Anchor thresholds with no less than four (4) machine screw anchors for 3'0" lengths. Provide non-ferrous solid brass or stainless-steel screws.
 2. All thresholds shall have a non-skid abrasive surface with a metalized coating of hard aluminum-nickel alloy bonded into the aluminum threshold at high temperature no less than 7200° F.
 3. Provide premium quality aluminum and vinyl weather-strip door seal for head and jambs for all doorframes specified to require weatherstripping in the remark's column of the door schedule. The seals shall be an airfoil design to permit full and positive closure between door and jamb. The aluminum housing shall have a factory applied pressure sensitive two-way tape to permit adhesive application of the weatherstripping, prior To installation of Tech-Type self drilling screws. After the weatherstripping is adhesive applied, Tech-Type self-drilling screws shall be used to fasten the aluminum housing in place.

4. The door bottom seal shall be concealed in the bottom of the door and shall be a flexible synthetic vinyl that will not take a formal set, nor break or flake in cold weather. The door bottom seal shall extend the full width of the door and shall also extend below the door bottom and compress against the top for the threshold, for complete closure. The door bottom seal shall be fastened to the recessed channel with 3 or 4 screws through the seal or the seal chassis.
5. Surface applied door bottoms shall not be considered acceptable. Concealed door bottoms must be installed before the door is in place.

I. FINISH:

1. With the exceptions of hinges, door closers, plates, coordinators, thresholds weatherstripping, all hardware items shall be furnished in satin chrome finish US26D.
2. Exceptions are as follows:
Door Closers: Sprayed Aluminum
Thresholds: Aluminum
Weatherstripping: Aluminum

PART 3 - EXECUTION

3.1 DELIVERY

Deliver the work of this Section to the job site in a timely manner to permit orderly progress of the total work.

3.2 EXISTING CONDITIONS

Examine framed door openings for trueness and size. Do not attempt to install doors until improper conditions have been corrected.

3.3 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory.
- B. Paint backside of frames to be set in masonry with bituminous coating.
- C. Prior to installation, adjust and securely brace steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 3. Twist: Plus or minus 1/16 inch, measured at opposite face comers of jambs on parallel lines, and perpendicular to plane of wall.
 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- D. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

3.4 INSTALLATION

- A. Install frames in accordance with SDI-105. Install doors in accordance with DHI.
- B. Coordinate with wall construction for anchor placement.

- C. Install frames perfectly plumb, true, and level. Doors shall operate freely, smoothly, and close tightly against weather-stripping. Doors with closers shall be able to close and latch automatically.
- D. Where galvanized coating has been removed, due to handling or grinding, touch up areas of hollow metal doors and frames with an approved zinc-rich primer.
- E. Protect hollow metal doors and frames during transportation and storage. Store undercover on wood blocking. Remove the polyethylene or cardboard cover and handle and store in a manner to prevent rusting and other damage. After installation, protect doors from damage during subsequent activities.
- F. Hollow metal doors shall be shimmed, as necessary, to allow equal clearance at hinge and lock stile. Clearance shall not exceed 3/16" at either jamb.

3.5 ADJUSTING AND CLEANING

- A. Final Adjustments: Remove and replace defective work, including steel doors or frames that are warped, bowed, or otherwise unacceptable.
- B. Clean grout and other bonding material off steel doors and frames immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

SECTION 08 50 00
WINDOWS

PART 1 - GENERAL

1.1 **SECTION INCLUDES**

- A. Vinyl New Construction Windows.

1.2 **RELATED SECTIONS**

- A. Cast-In-Place Concrete.
- B. Carpentry.
- C. Rough Carpentry.

1.3 **REFERENCES**

- A. ANSI/AAMA/NWDA 101/I.S.2; 97 and current A-440-05 - Voluntary Specification for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors with revisions contained in "reprinting" of 12/99.
- B. AAMA 701/702 - Combined Voluntary Specifications for Pile Weather strip and Replaceable Fenestration Weather seals.
- C. AAMA 902 - Voluntary Specification for Sash Balances.
- D. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen.
- E. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
- F. ASTM E 547 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Cyclic Static Air Pressure Difference.
- G. ASTM E 1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
- H. ASTM E 1996 - Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
- I. ASTM E 2190 - Standard Specification for the Classification of the Durability of Sealed Insulating Glass Units.
- J. ASTM F 588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact.
- K. NFRC 100/200 – Procedure for Determining Fenestration Product U-Factors and Solar Heat Gain.

1.4 **SUBMITTALS**

- A. Submit as specified four (4) copies of submittals for review.

- B. Submit the following documents for each type of window.
 - 1. Manufacturer's technical data, product descriptions and installation guides.
 - 2. Elevation for each style window specified indicating its size, glazing type, muntin type and design.
 - 3. Manufacturer's head, jamb and sill details for each window type specified.
- C. Selection Samples: For each finish product specified, a complete set of Color chips representing manufacturer's full range of available Colors.
- D. Verification Samples: Provide operating units of each style window specified.
 - 1. Verification samples may be operating scaled-down mock-ups of actual-size units.
 - 2. Operating hardware such as balances, sash locks and weather-stripping.
 - 3. Verification samples will be returned to manufacturer's representative at project closeout.
- E. Test Reports: Submit certified independent testing agency reports indicating window units meet or exceed specified performance requirements.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum ten (10) years producing vinyl (PVC) windows.
- B. Installer Qualifications: Utilize an installer having demonstrated experience on projects of similar size.
- C. Source Limitations: Obtain window units from one manufacturer through a single source.
- D. Provide window units independently tested and found to be in compliance with ANSI/AAMA/NWDA 101/I.S.2-97 and current A440-05 performance standards listed above.
- E. Code Compliance: Provide windows that are labeled in compliance with the jurisdiction having authority over the project.
- F. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Engineer.
 - 2. Do not proceed with remaining work until workmanship and color are approved by Engineer.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver windows to project site in undamaged condition; handle windows to prevent damage to components and to finishes.
- B. Store products in manufacturer's unopened packaging, out of direct sunlight or high temperature locations, until ready for installation.

1.7 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 absolute limits.

1.8 WARRANTY

- A. Submit manufacturer's standard warranty against defects in workmanship and materials.
 - 1. Limited Lifetime Limited Transferable warranty on extruded solid vinyl member and component parts. Insulated glass is warranted against material obstruction of transparency resulting from film formation or dust collection on the interior glass surfaces for a period of twenty (20) years.
 - 2. The warranty period for commercial project work is 10 years, covering all vinyl, glass and component parts.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Harvey Building Products, which is located at: 1400 Main St. ; Waltham, MA 02451-9180; Toll Free Tel: 800-598-5400; Tel: 781-398-7800; Fax: 781-398-7749; Web: www.harveybp.com
- B. Substitutions: Or approved equal.
- C. Requests for substitutions will be considered.

2.2 NEW CONSTRUCTION CLASSIC SINGLE HUNG WINDOWS

- A. Construction:
 - 1. Frame: 0.065 inch (1.7 mm) thick polyvinyl chloride (PVC) with miter cut and fusion welded corners. Sash: 0.060 inch (1.5 mm) thick polyvinyl chloride (PVC) with miter cut and fusion welded corners.
 - 2. Siding Attachment: With or without extension jamb receiver pocket.
 - 4. Integral 13/16 inch (21 mm) "J" fin pocket.
 - 6. Color: White Vinyl.
 - 7. Glazing: Insulating glass units secured to sash frame using a silicone sealant and exterior glazing bead. Complies with ASTM E2190.
 - 8. Sash Locks: Cam type lock anchored with screws. Double locks when openings are 30 1/2 inches (774 mm) wide and greater.
 - 9. Weather Stripping: In compliance with AAMA 701.2.
 - 10. Screens: FlexScreen full screen.
- B. Performance:
 - 1. Structural rating H-LC50 (DP50) - Test Size: 42 inches x 77 inches in accordance with AAMA/WDMA/CSA 101/I.S.2/A440-17.
 - 2. Forced Entry: Type B, Grade 10 in accordance with ASTM F588.
 - 3. Sound Transmission Class (STC): 34.
 - 4. Thermal Transmittance: The following values are in accordance with NFRC 100/200/500.
 - a.SunShield No Grids: U-Factor 0.28/ R-Value 3.57/ SHGc 0.21/ VT 0.49.
 - 5. Window performance data to meet or exceed maximum SHGC = 0.40
 - 6. Air leakage: Maximum air leakage = 0.20cfm/ft² at 1.57psf pressure differential.
 - 7. Operable windows maximum air leakage = 0.30cfm/ft² at 1.57psf per ASTM E283 or NFRC 400.
 - 8. U-Factor Operable windows: Maximum U-Factor = 0.36 BTU/h ft² °F
 - 9. U-Factor Entrance Doors with Glazings: Maximum U-Factor = 0.61 BTU/h ft² °F tested and labeled per NFRC.

2.3 NEW CONSTRUCTION WINDOW ACCESSORIES

A. Mullions:

1. Common Jamb: Windows are contained within single frame and separated by a common mull post.
2. Non-Structural Combination Mullion: horizontal or vertical members. May be factory or field applied.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify rough opening size is of sufficient size to receive window unit and complies with manufacturer's requirements for opening clearances.
- B. Verify that sill plate is level.
- C. Notify Architect/Engineer of unacceptable conditions before proceeding with installation.

3.2 INSTALLATION

- A. Install window unit in accordance with manufacturer's printed instructions.
- B. Apply sealant around perimeter of window unit between nail fin and exterior sheathing of wall. Refer to Division 7 Section "Joint Sealants".
- C. Install window unit level and plumb. Center window unit in opening and secure window unit by nailing through nail fin and screw through jambs as indicated in manufacturer's instructions.
- D. Flash window in accordance with AAMA's "Standard Practice for Installation of Windows with a Mounting Flange in Stud Frame Construction".
- E. Insulate between window frame and rough opening with insulation. Refer to Division 7 Section "Building Insulation".

3.3 ADJUSTING

- A. Adjust units for smooth operation without binding or racking.
- B. Adjust sash locks and screens for smooth operation.

3.4 CLEANING

- A. Clean soiled surfaces and glass prior to substantial completion.

3.5 PROTECTION

- A. Protect window unit from damage until substantial completion. Repair or replace damaged units.

SECTION 09 29 00
GYPSUM WALLBOARD

PART 1 - GENERAL

1.1 **DESCRIPTION**

- A. **Work Included:** Provide all gypsum wallboard and accessories complete in place as shown on the Drawings, specified herein, and needed for a complete and proper installation.
- B. Textured ceilings where indicated on the finish schedule.

1.2 **QUALITY ASSURANCE**

- A. **Standards:** Comply with industry standards.
- B. **Qualifications of Manufacturer:** Products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Engineer.
- C. **Qualifications of Installers:** Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.3 **PRODUCT HANDLING**

- A. **Protection:** Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.
- B. **Replacements:** In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.
- C. **Delivery and Storage:** Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturers' recommendations as approved by the Engineer.

PART 2 - PRODUCTS

2.1 **GYPSUM WALLBOARD**

Comply with Fed. Spec. SS-L-30, type III, class I, style 3, taper-edged, and of the grade and form specified below, in 48" widths and in such lengths as will result in the minimum of joints. Unless otherwise stated, thickness shall be 5/8". Use fire-rated gypsum board unless otherwise stated. (Use ASTM C630 moisture resistant wallboard in areas subject to water.)

2.2 **METAL TRIM**

- A. **Trim Features:** Provide hot-dip galvanized 0.0217" nominal thickness (26 gauge).
- B. **Casing Beads:** Channel shaped with concealed wing not less than 7/8" wide, and an exposed wing.

- C. Corner Beads: Provide angle shaped with wings not less than 7/8" wide and perforated for nailing and joint treatment, or with combination metal and paper wings, bonded together, not less than 1-1/4" wide and suitable for joint treatment.
- D. Perimeter Edge Beads: Edge beads for use at perimeter of ceilings shall be angle shaped with wings not less than 3/4" wide. Concealed wing shall be perforated for nailing and exposed wing shall be folded flat. Exposed wing may be factory finished in a white color.

2.3 JOINTING SYSTEM

The jointing system shall include reinforcing tape and compound designed as a system to be used together and shall be only as recommended by the manufacturer of the gypsum wallboard used. Jointing compound may be used for finishing if so recommended by the manufacturer.

2.4 FASTENING DEVICES

For fastening the gypsum wallboard in place, use flathead screws, shouldered, specially designed for use with power-driven tools, not less than 1" long, with self-tapping threads and self-drilling points.

2.5 WATER FOR COMPOUND

If the approved jointing system requires job-addition of water, use only clean and potable water for that purpose.

2.6 OTHER MATERIALS

All other materials, not specifically described but required for a complete and operable installation of the work of this Section, shall be new, first quality of their respective kinds, and subject to the approval of the Engineer.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Inspection: Prior to installation of the work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence. Check that the wall studs or ceiling members are straight and in line. Verify that gypsum wallboard may be installed in strict accordance with all pertinent codes and regulations, the manufacturers' recommendations as approved by the Engineer, and the original design.
- B. Discrepancies: Do not install gypsum drywall until all unsatisfactory conditions have been corrected. Commencement of the work of this Section signifies acceptance of the conditions by this contractor.

3.2 INSTALLATION

- A. General: Install the gypsum wallboard with the separate boards in moderate contact but not forced into place. At internal and external corners, conceal the cut edges of the board by the overlapping covered edges of the abutting boards. Stagger the boards so that corners of any four boards will not meet at a common point except in vertical corners.
- B. Ceilings: Install the gypsum wallboard to ceilings with the long dimension of the wallboard at right angles to the supporting members, except that wallboard may be installed with the

long dimension parallel to supporting members that are spaced 16" on center when attachment members are provided at end joints.

- C. Walls: Install the gypsum wallboard to studs at right angles to the furring or framing members. Make end joints, where required, over furring or framing members.
- D. Attaching: Drive the specified screws with clutch-controlled power screwdrivers, spacing the screws 12" on centers at ceilings and 16" on centers at walls, except that where framing members are spaced 24" apart on walls screw spacing shall be 12" on centers.
- E. Access Doors: By careful coordination with the Drawings, install the specified access doors where required, anchoring firmly into position for long life under hard use and aligning properly to achieve an installation flush with the finished gypsum drywall surface.

3.3 JOINT TREATMENT

General:

- A. Inspect all areas to be joint treated, ascertaining that the gypsum wallboard fits snugly against supporting framework.
- B. In areas where joint treatment and compound finishing will be performed, maintain a temperature of not less than 55 degrees F. for 24 hours prior to commencing treatment, for the entire period of treatment, and until joint and finishing compounds have dried.
- C. Apply the joint treatment and finishing compound by machine or hand tool.
- D. Provide a minimum drying time of 24 hours between coats, with additional drying time in poorly ventilated areas.
- E. Embedding Compound: Apply to gypsum wallboard joints and fastener heads in a thin uniform layer. Spread the compound not less than 3" wide at joints, center the reinforcing tape in the joint, and embed the tape in the compound. Then spread a thin layer of compound over the tape. After this treatment has dried, apply a second coat of embedding compound to joints and fastener heads, spreading in a thin uniform coat to not less than 6" wide at joints, and feather edged. When thoroughly dry, sandpaper to eliminate ridges and high points.
- F. Finishing Compound: After embedding compound is thoroughly dry and has been completely sanded, apply a coat of finishing compound to all joints and fastener heads. Feather the finishing compound to not less than 12" wide. When thoroughly dry, sandpaper to obtain uniformly smooth surfaces, taking all necessary care to not scuff the paper surface of the wallboard.

3.4 CORNER TREATMENT

- A. Internal Corners: Treat as specified for joints, except that the reinforcing tape shall be folded lengthwise through the middle and fitted neatly into the corner.
- B. External Corners: Install a corner bead fitting neatly over the corner and secured with the same type fasteners used for applying the wallboard, spacing the fasteners approximately 6" on centers and driving through the wallboard into the framing or furring member.
- C. After the cornerpiece has been secured into position, treat the corner with joint compound and reinforcing tape as specified for joints, feathering the joint compound out from 8" to 10" on each side of the corner.

3.5 OTHER METAL TRIM

- A. General: The Drawings do not purport to show all locations and all requirements for metal trim in connection with the work of this Section. Carefully study the Drawings and the installation: provide in place all metal trim normally recommended by the manufacturer of the gypsum wallboard used.
- B. Installation: Install the metal trim in strict accordance with the manufacturer's recommended methods of installation, providing not less embedment and finishing than specified above for corner treatment.

3.6 CLEANING UP

Use all necessary care during execution of this portion of the Work to prevent scattering of gypsum wallboard scraps and dust and to prevent tracking of joint and finishing compound onto floor surfaces. At completion of each segment of installation in a room or space, promptly pick up and remove from the working area all scraps, debris, and surplus material of this Section.

SECTION 09 51 00
SUSPENDED CEILINGS

PART I - GENERAL

1.1 **DESCRIPTION**

- A. **Work Included:** Provide suspended ceilings complete and in place, including all associated hardware, as shown on Drawings, specified herein, and needed for a complete and proper installation. Products required for this work include, but are not necessarily limited to:
1. Suspended ceiling tiles.
 2. Ceiling grid system.
 3. Grid system suspension hangers.
 4. Coordination with other trades, including grille, diffuser, and light fixture installation, etc.

1.2 **QUALITY ASSURANCE**

- A. **Standards:** Comply with ASTM C636 "Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels".
- B. **Qualifications of Manufacturer:** Products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Engineer.
- C. **Qualifications of Installers:** Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- D. **Design Requirements:** Design of ceiling suspension system, including related components, shall meet or exceed the minimum requirements as established by the building code having jurisdiction.

1.3 **SUBMITTALS**

- A. **Manufacturers' Data:** Within 15 calendar days after award of Contract, submit:
1. Complete materials list of all items proposed to be furnished and installed under this Section.
 2. Samples of each size of decorative component, and each finish color available in the specified material.

Manufacturer's recommended installation procedures.

1.4 **PRODUCT HANDLING**

- A. **Protection:** Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.
- B. **Replacements:** In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

- C. Delivery and Storage: Deliver all materials to the job site in their original unopened containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturer's recommendations.

PART 2- PRODUCTS

2.1 GENERAL

Whenever possible, for each type of application, use the products of the same manufacturer for panels, suspension system, and accessories, and as approved in submittals to the Engineer.

2.2 CEILING PANELS, SAT-1

- A. Type: Use Armstrong "Fine Fissured" minaboard panels or approved equal.
- B. Size: Standard 24" x 24" x 5/8" – Fine Fissured #1728 square lay-in.
- C. Color: White
- D. Sound Absorption: NRC 0.55
- E. Sound Transmission: CAC 33
- F. Flame Spread: Class A, 0 - 25.
- G. Finish: Perforated with factory-applied white latex paint finish.

2.3 SUSPENSION SYSTEM

- A. General: Grid system to be Heavy-Duty, Fire Guard, 15/16" exposed track by Armstrong, or stronger.
- B. Main and Cross Tees: Use commercial quality cold-rolled steel, pre-painted, double web shape with 15/16" exposed flange and rolled cap. Main tee to have cross tee holes at 6" o.c. and hanger wire holes at 2" o.c. Cross tees to interlock with main tees and lower flange extended and offset to provide flush level intersection. Main runners at 2' on center. Color selection by the Engineer.
- C. Wall Molding: Use angle finished same as tees.
- D. Wire: Use 12 gauge soft annealed steel at 4' intervals, staggered.
- E. Top Fasteners: Use hook-eyes or other suitable attachment sufficient to support the entire system when attached to the truss system.
- F. Clips: Provide metal hold-down clips for securing tiles in place. Minimum 4 clips per tile.

PART 3 - EXECUTION

3.1 INSPECTION

Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Profile Alignment: Inspect the Drawings and the field conditions to determine the minimum and maximum elevations of the grid system.
- B. Hanger Attachment: Determine, prior to commencing any work, the hanging procedures necessary to meet the strength and alignment requirements of this installation.
- C. Grid Pattern: Grid pattern shall run as shown on reflected ceiling plans. Review layout with Engineer prior to commencing installation. Assure that installation of suspended ceiling lighting is coordinated properly and neatly with this work.
- D. Panel Installation: Take extreme care in handling the ceiling panels. Do not allow edges to be damaged or surfaces to be soiled. Install panels so as to conform to configuration indicated on Drawings.
- E. Cutting of Panels: Cut planar panels for lighting fixtures and other equipment penetrating the ceiling as required by Drawings and as determined by coordination with installers of other work. This Contractor shall cut and trim the suspended ceiling for lighting and air handling where required, as shown on Drawings.
- F. Patching and Repairing: Patch and repair all surfaces where existing equipment is removed, and match the existing surrounding surfaces in material and finish to approval of the Engineer.
- G. Cleaning and Touchup: After complete installation has been made, clean all surfaces of the installation, remove discolorations and foreign matter, and touch up all damaged parts and edges with the same finish as was used for the factory-applied finish of the components.
- H. Spare Tile: Contractor to leave with owner a minimum of 10 spare tile of each type for future replacement.

SECTION 22 00 00
PLUMBING GENERAL PROVISIONS

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all labor, materials, equipment, transportation, permits, inspections, and incidentals required to install and complete all plumbing work as shown on the drawings or specified herein or both.
- B. All work shall be subject to the terms and conditions of the contract and applicable portions of the General Conditions and Special Conditions.
- C. All work and materials shall be in strict accordance with these drawings and specifications even though they may be in excess of the applicable codes, ordinances, and regulations.
- D. Whenever the word "provide" is used, it means furnish and install complete and ready for use.

1.2 DRAWINGS

- A. The general location of the apparatus and the details of the work are shown on the accompanying drawings, which form a part of this specification. Exact locations are to be determined at the building as the work progresses and shall be subject to the Owner's and or Engineer's acceptance.
- B. Anything shown on the drawings and not mentioned in the specifications or vice versa, shall be furnished as if it were both shown and specified.
- C. Due to the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. The Contractor will be required to investigate the structural and finish conditions affecting his work and shall arrange such work accordingly, furnishing such fittings, traps, valves, and accessories as may be required to meet such conditions.
- D. All questions as to the interpretation or extent of the drawings and specifications shall be referred to the Engineer. Failure to do this shall not relieve the Contractor of responsibility to provide all materials and work in accordance with the intent of these plans and specifications at no extra charge.

1.3 RECORD DRAWINGS

- A. The contractor shall maintain at site two separate sets of black line prints of the Plumbing Drawings. As the work progresses, he shall mark neatly and accurately all changes from the original layouts and the work accomplished day by day. Colors shall be used in marking the various services.
- B. These sets of prints will be inspected and considered a guide to determining the amount of work installed. If these drawings are found inaccurate or incomplete, they shall be corrected promptly. This procedure is mandatory and the Engineer will not review requisitions for payment until satisfied that this has been complied with and is up-to-date.
- C. These "As Built" drawings shall be turned over to the Engineer upon completion of the project for preparation of reproducibles by the Engineer for the Owners.

D. Final payment will not be made until these "As Built" drawings have been received and accepted.

1.4 GENERAL CONDITIONS

- A. All materials entering into the installation must be new and of the quality specified, otherwise to be of the best commercial quality obtainable for the purpose. All parts of the work and the erection thereof must be performed in the best and most substantial manner in accordance with the standards of the trade and all applicable codes.
- B. The Contractor shall visit the site and building during construction and shall take such measurements as necessary for him to determine that actual conditions follow these plans and specifications such that he may properly install his work without interferences or work hold-ups.
- C. The Contractor shall study all drawings and specifications to determine any conflict with other trades. Any conflicts shall be submitted to the Engineer before starting work. The Architectural, Structural, Mechanical, and Electrical Drawings should be followed and this section of the work fitted thereto.
- D. Submittal of bid shall indicate that this Contractor has examined the site and drawings and has included all required allowances in his bid. No allowances shall be made for error resulting from Contractor's failure to visit job site and to review drawings.
- E. The Contractor shall be responsible for performing all operations in connection with this work and the satisfactory operation and tightness of all water, drainage, and venting systems under this contract.

1.5 CODES, PERMITS, INSPECTIONS

- A. The installation shall comply with all local laws applying to plumbing installations in effect at the site and regulations of any other Governmental body or agency having jurisdiction and with the regulations of the State of Maine Internal Plumbing Code, based on the 2021 Uniform Plumbing Code, where such regulations do not conflict with these laws.
- B. If there are any conflicts between the plans and/or specifications with the laws or local ordinances, the Contractor shall submit these conflicts to the Engineer before starting any work. Any work, done prior to this submittal, that needs to be changed to conform to these laws, ordinances or codes shall be made at the Contractor's expense.
- C. The Contractor shall obtain and pay for all permits, inspections, and licenses required.
- D. After completion of the work, the Contractor shall furnish to the Engineer for the Owner, a certificate of final inspection and acceptance from the inspector having jurisdiction.

1.6 EXTRA WORK ORDERS - CREDITS

No extra work will be paid for unless authorized by the Owner in writing. Where extra work is required, the Contractor shall provide an itemized account of the work involved and shall take into consideration any credits due or work omitted for any reason. Estimates shall clearly list such omitted work with proper credit given for same.

1.7 COOPERATION BETWEEN TRADES

- A. The Contractor shall give full information to the General Contractor and other Contractors, sufficiently in advance of this work, so that all necessary work by the other trades may be planned and installed without any delays. The Contractor shall furnish and locate all sleeves, supports, anchors, etc., so that the General Contractor may install the same in place. The

Contractor shall locate all necessary work in advance without delay to the other trades. The Contractor shall advise the General Contractor of required partition thickness and furring to conceal cast iron hubs.

- B. In case of failure to give proper information as noted above, the Contractor will be required to do his own cutting and patching, or have same done by the General Contractor, but in no case shall there be any additional expense to the Owners.
- C. If Contractor installs his work before coordinating with other trades, or so as to cause any interference with work of other trades, he shall make the necessary changes in his work to correct the conditions without extra charge.

1.8 PROTECTION

- A. Contract Materials: The Contractor shall protect all materials and fittings, furnish board enclosures for all water closets, urinals, and lavatories, and protect all enameled surfaces with pasted on paper. No fixtures shall be used prior to acceptance.
- B. Material of Other Trades: The Contractor shall see that care is exercised to prevent injury, discoloration, or defacement of all finished building surfaces. The Plumbers shall do no cutting or fitting of any material other than his own. He shall exercise proper supervision to prevent floods, plumbing torches, and portable fires in the building. Any damage resulting therefrom shall be adjusted under this section to the full satisfaction of the Owner at no additional cost or increase in Contract time.
- C. Pipes: All open ends of pipe shall be properly capped or plugged during the construction period to prevent entrance of foreign materials and damage. No piping shall be installed outside of a building or in an exterior wall unless adequate provision is made to protect such pipe from freezing.
- D. No structural members shall be cut without acceptance of the Engineer.

1.9 TEMPORARY WATER

The General Contractor is to provide his own source of water, including storage, in preliminary stages of construction.

1.10 GUARANTEE

- A. The Contractor shall and hereby does guarantee that all work executed under this section will be free from defects of materials and workmanship for a period of one (1) year from the date of the final certificate and agrees to repair, free of expense to Owner, any defects that may occur within that time.
- B. The Contractor shall further warrant that all materials furnished and work executed is in accordance with all applicable laws, regulations, etc.
- C. The Contractor will not be responsible for defects which are clearly the result of bad usage of the equipment by persons not under his control.

PART 2 - PRODUCTS

2.1 BASIC MATERIALS AND METHODS

Unless otherwise indicated, the materials to be furnished under this contract shall be standard products of manufacturers regularly engaged in the production of such equipment, and shall be the manufacturer's latest standard design that complies with the specification requirements.

2.2 CLEANOUT

- A. Cleanouts shall be installed for soil, waste, and roof drainage piping at base of all risers, at changes in direction, where shown on plans, and as otherwise required.
- B. Provide a PVC Body, a PVC taper thread plug, round scoriated nickel bronze adjustable cover with vandal proof screws, Zurn #CO-2450 Series or equivalent.
- C. Provide clamping collar or membrane flange when required.

2.3 HANGERS

Hangers shall be copper clad steel band for all piping. Wrap band snug around shield and insulation and bolt together at top of insulation. Adjustable ring or clevis type may be used. Maximum support spacing shall comply with Section 313.0, Hangers and Supports, State of Maine Plumbing Code. Provide wall brackets for hangers on piping running on sidewalls. Provide hangers sized for insulation and galvanized shields for piping up to and including 2". Over 2" see Insulation Section of this Specification. All hangers shall be primer coated and one finish coat after installation.

2.4 HANGER SHIELDS

Insulation protection shields shall be 180°, carbon steel, galvanized equivalent to Grinnell Fig. 167. For pipe sizes 1/2" to 2", they shall be 18 gauge and 12" long.

2.5 SLEEVES

- A. Sleeves of steel pipe shall be furnished for straight runs of piping through masonry walls, masonry or stud partitions and floors. When piping is not insulated, the sleeves shall be two sizes larger than pipe size. When piping is insulated, the sleeves shall be large enough to allow approximately 1/4" space all around, between sleeves and insulation passing through sleeve. The Contractor will grout sleeve in place. Openings between sleeves and pipes shall be caulked and sealed smoke, fire, and watertight. Sleeves thru floor slabs shall extend 1" above finished floor.
- B. All interior wall sleeves (floor and wall) penetrations that accommodate piping shall be sealed with a three-hour rated sealant. Sealant shall be 3M Fire Barrier 2001 RTV Silicone Foam. Apply as directed by manufacturer.

2.6 PLATES

Chrome-plated, one piece wall, floor and ceiling escutcheon plates shall be provided at all uncovered piping in finished rooms.

2.7 IDENTIFICATION

Tag all new valves with Seton #m4506, or equal, 1-1/2" square brass tags and #6 bead chains, stamped with the following identification: "CW", "HW", "RHW" "Air", "Gas", or "Fire". Tags shall

be consecutively numbered. DO NOT DUPLICATE EXISTING VALVE IDENTIFICATION NUMBERS. Fixture stops, control valves or valves adjacent to equipment, the use of which is obvious are not to be tagged.

Identify all new domestic cold water, hot water, recirculating hot water, gas, and sprinkler piping with "Set Mark" full snap-around pipe markers by Seton Name Plate Corporation or approved equal by Brady Corp. Markers shall include both identification and direction flow. Markers shall be no less than 10 feet apart except in Boiler Room where they shall be not less than 20 feet apart. Identification shall read "Domestic Cold Water Supply", "Domestic Hot Water Supply", "Domestic Recirculating Water", "Air", "Gas", and "Sprinkler" as applicable. Domestic hot and cold water piping shall be labeled differently from heating hot water.

Contractor shall provide Valve Tag Schedule as part of closeout documents.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Branch lines from service or main lines shall be taken off the top of the main or bottom of main, using such cross-over fittings as may be required by structural or installation conditions. All service pipes fittings and valves shall be kept a sufficient distance from other work to permit not less than 1/2 inch from finished covering and such other work, and not less than 1/2 inch between finished coverings on different services.
- B. All changes in pipe size and direction of soil, waste and storm lines shall be made with Y's and cleanouts, reducing fittings, or recessed reducers. Y's and 45-degree fittings, or 45-degree combination fittings, shall be used wherever possible. Use long sweep bends at bottom of stacks.
- C. All off-sets shall be made at an angle of not more than 45 degrees. All horizontal runs of soil and waste piping shall have a pitch of 1/4 inch to the foot unless indicated.
- D. Where vertical stacks turn to run horizontally, long sweep 1/4 bends or combination Y and 1/8 bends shall be used. Sanitary T's may be used where horizontal branches connect to vertical stacks. Long sweep fittings shall be used wherever conditions permit. Short radius fittings may be installed where in conformity with the Plumbing Code. Furnish and install cleanouts at bottom of all soil and waste stacks, at every change in direction on soil and waste piping, and where indicated on the drawings.
- E. Buried pipe shall be firmly bedded on a compacted gravel bedding at the required line and grade so that the barrel of the pipe rests on its entire length on the bottom of the trench. The interior of the pipe shall be clean when it is lowered into the trench. In no case shall the spigot end in the pipes chipped to avoid the use of a bend. Backfill for all the pipes shall be placed and compacted in accordance with the best practice of the trade.
- F. All piping shall be supported from the building structure with pipe hangers. All piping over 2-1/2" size shall be supported from top chord of joists.
- G. Cleanouts shall be provided in soil and waste piping in locations such that all portions of the lines shall be readily accessible for cleaning or rodding out. The maximum horizontal distance between cleanouts in piping shall not exceed fifty (50) feet on 4 inch and larger piping, thirty-five (35) feet on 3 inch piping; cleanouts shall be of the same size as the pipe in each case with 4 inch as the maximum size. Traps not integral with fixtures and in accessible locations shall be provided with brass trap screw protected by the water seal, and will be regarded as a cleanout.

- H. Test tees with brass cleanout plugs shall be installed at the foot of all vertical soil and waste lines. Wherever cleanouts on vertical lines occur concealed behind finished walls, they shall be extended to back of finish wall and a stainless steel or brass wall plate shall be provided flush with finished wall.
- I. When cleanouts occur on lines under floor slabs, they shall be brought up to underside of finished floor and shall have a floor cleanout with a rim at finish floor level.
- J. Exposed waste piping, traps and supplies to any fixture shall be chromium plated pipe or tubing and fittings.
- K. Any fixture or drain not having an integral trap shall have a separate trap provided adjacent to it.
- L. Cleanouts shall be provided at the base of all vent stacks.

3.2 TESTS

- A. All water piping shall be tested to a pressure of 125 lbs. per square inch for at least 30 minutes. Pressure drop in this period shall not exceed two lbs.
- B. Before each test is made on domestic water piping, the Contractor shall flush clean the system ready for test. After final test, all mixing valves, flush valves, check valves, strainers, storage tanks, circulating pumps, etc., shall be opened and all foreign material flushed or wiped clean. The Contractor shall submit a statement in writing to the Owner that all flushing has been completed and that the fixtures are free from foreign material.
- C. All drainage systems shall be tested in accordance with any laws or ordinances that apply. Each entire drainage system shall be tested with water and proved tight before any of the work is covered up.
- D. The Owners and/or Engineer shall be advised 48 hours in advance of all tests and the Contractor shall submit a statement in writing to the Engineer that all tests have been completed in accordance with specification and codes, and shall include a written acceptance from the local Plumbing Inspector.
- E. Contractor shall provide report indicating hot water temperatures at all lavatories, sinks, showers, and mixing valve locations. The report shall be part of the closeout documents.

3.3 FINAL CLEANING

The Contractor, on completion of the work and building, is to clean all fixtures and his work, to the satisfaction of the Engineer, and instruct the proper person in the use and control of the entire plumbing system. The Contractor shall remove all oil and debris, clean and polish all fixtures and metal to be exposed, clean out and flush all piping systems, traps, and cleanouts.

3.4 FINAL ACCEPTANCE

Before final acceptance of the work under this section, all damaged or imperfect materials shall be refinished or replaced. All debris, scaffolding, and tools shall be removed and premises shall be "broom clean" to the satisfaction of the Engineer.

SECTION 22 07 00
PLUMBING INSULATION

PART 1 - GENERAL

1.1 **SCOPE**

- A. Insulate all new cold water, hot water, and recirculating hot water piping.
- B. Insulate all new roof drain piping above the slab.

1.2 **GENERAL CONDITIONS**

- A. Refer to General Provisions Section 22 00 00 for provisions affecting work in this section.
- B. Heating piping and ductwork insulation specified in Section 23 00 00.

PART 2 - PRODUCTS

2.1 **PIPE INSULATION**

- A. Piping insulation shall be glass fiber pipe insulation with a reinforced kraft-aluminum foil jacket. Equal to Certainteed™ 500° Snap* On Pipe Insulation. Pipe insulation shall have a minimum wall thickness of not less than the pipe diameter for hot water and hot water return pipe diameter of up to 2" for hot water, hot water return pipe condensate, and cold water piping. Piping which conveys fluid temperatures greater than 200°F shall meet or exceed the requirements set forth via 2021 IECC Table C403.12.3.
- B. Fittings and joints shall be insulated and finished with a one-piece premolded high impact PVC fitting covers with fiberglass inserts and accessories, 25/50 rated, equal to Proto LoSmoke brand.

PART 3 - EXECUTION

3.1 **PREPARATION**

- A. All pipe surfaces to be covered shall be thoroughly cleaned before applying any insulation.
- B. All testing of systems shall be completed before applying insulation.

3.2 **INSULATION**

- A. All laps, joints and seams must be sealed for a vapor barrier, using manufacturer's recommended adhesive.
- B. All insulation shall be applied in accordance with the manufacturer's recommendations and applied in a first class manner.
- C. All fittings and valve bodies (concealed and exposed) on all piping shall be insulated to equal thickness. (Concealed shall be finished same as exposed.)
- D. Insulate with same material as piping or apply fiberglass molded or segmental insulation to fittings equal in thickness to that of the insulation to be applied to adjoining pipe and securely fasten in place, using wire.

SECTION 22 11 00
WATER SYSTEM

PART 1 - GENERAL

1.1 SCOPE

The work under this section shall include all labor and material to install a domestic water system as shown on the drawings or specified herein or both.

1.2 GENERAL CONDITIONS

Refer to General Provisions Section 22 00 00 for provisions affecting work in this section.

1.3 CROSS CONNECTIONS

- A. No piping shall be installed to permit any back siphonage or flow of any polluted liquid into water distribution system.
- B. Vacuum breakers, air gaps or funnel type drains shall be used as required by local and State Plumbing Codes. All piping to faucets with hose threaded outlets and all fixtures with their outlets below the overflow shall have vacuum breakers.

1.4 WORK INCLUDED

- A. The work shall include, but shall not be limited to the following:
 - 1. Fixtures connected (whether supplied or not).
 - 2. Hot and cold water systems.
 - 3. Piping, hangers, sleeves, fittings, valves, gauges, controls, etc., required to complete the system.
 - 4. Provide electric water heaters and all controls.
 - 5. Building water mains, to 5'-0" outside walls.

1.5 WORK BY OTHERS

- A. The following work, which is incidental to the installation, will be executed by others under the direction of the Contractor:
 - 1. Execute all required masonry and carpentry work, cutting, patching, furring's, plastering, etc., except as herein noted.
 - 2. Execute all required excavation work, backfilling, grading, etc. for water.
 - 3. Finished painting of piping, supports except as herein noted.
 - 4. Access panels in ceilings and walls for access to valves.

PART 2 - PRODUCTS

2.1 BASIC MATERIALS AND METHODS

- A. Unless otherwise indicated, the materials to be furnished under this contract shall be standard products of manufacturers regularly engaged in the production of such equipment, and shall be the manufacturer's latest standard design that complies with the specification requirements.

- B. All copper tubing shall be cut through and the ends shall be reamed out to the full inside diameter of the pipe.

2.2 DOMESTIC HOT AND COLD WATER SYSTEM

- A. Copper tubing shall be Type "L" for above ground, ASTM B-88.
- B. Copper tubing shall be Type "K" for underground, ASTM B-88.
- C. Types "K" and "L" copper tubing shall have joints of either wrought-copper or case brass solder joint fittings.
- D. Copper tubing and fittings shall be equivalent to Mueller Brass Co. Streamline Products.

2.3 SOLDER

Solder for all accessible joints shall be "Lead Free" made up of 95.5 percent tin, and 4 percent copper and .5% silver equal to Engelhard Silver Brite 100. Flux shall be non-corrosive. All joints shall be wiped clean of solder and flux. Piping underground or slab on grade shall have silver solder joints of at least 1000° degrees solder.

2.4 VALVES

- A. All valves shall be Nibco, Apollo, Hammond, Wolverine Brass, or equivalent. They shall be installed where indicated and otherwise required to provide for complete operation and drainage of the system. Ball valves shall be used for shut-offs and drains; globe valves shall be used for throttling and plug type for balancing. Solder or screw type may be used up to 2" size, screw type only for 2-1/2" size and over. All above ground valves shall be of one manufacture.
- B. Bronze Ball Valves: (Up to 3" size), chromium-plated ball, full port design, 600 psi, W.O.G. rated threaded ends. Federal Specification WWV-35B, Type II, Class A, Style 3, and MMS Sp-72.
- C. Bronze Globe Valves: Class 150, conforming to Federal Specification WW-V-51, Class B, Type I and MSS SP-80.
- D. Plug Valves: Lubricated Plug, Semi-steel construction, 175 psi. W.O.G., maximum temperature limitations are 200°F.

2.5 WATER HAMMER ELIMINATORS

Furnish and install water hammer eliminators for fixtures in accordance with PDI Standards.

2.6 EXPANSION JOINTS, LOOPS AND ANCHORS

Provide expansion joints and loops on hot water supply and circulating returns where required to control expansion. Provide rigid anchors where required. Anchors shall be bolted collars held by angular braces in direction of piping. Provide guides on each side of all expansion joints.

2.7 ELECTRIC HOT WATER HEATER

Furnish and install 10-gallon hot water heater for the building. Water heater shall be equal to A.O. Smith #DSE-10-3, T & P relief valve, 3000 Watt/240 Volt electric element, surface mounted thermostat, high limit control and overheat protection, adjustable temperature range.

2.8 THERMAL EXPANSION TANKS

Furnish and install where shown on drawings thermal expansion tanks. Units shall be rated for 150 psig working pressure, have 2.0 gallon capacity, steel shell, butyl diaphragm, and anti-legionella liner. Equal to Amtrol #ST-5C-DD.

2.9 WATER SYSTEM EXPANSION TANKS

Furnish and install where shown on drawings water system expansion tanks. Units shall be rated for 175 psig working pressure, have 18 gallons capacity, steel shell, butyl diaphragm and anti-legionella liner. Equal to AMTROL WELL-X-TROL #WX-401C.

2.10 WATER PUMP EQUIPMENT

- A. Deep Well Pump: Furnish and install (1) submersible deep well pump. 13 stage, 3/4 HP, 8.5 gpm @ 140' Head, 50 psi discharge pressure, 230 volt, single phase, 60 cycle. Equal to Goulds 7GS07412. With all necessary accessories and piping including but not limited to: Lightning Arrestor, Torque Arrestor, Subgard, Safety Cable, Adaptors & Fittings, Splice Kits, and Submersible Cable.
- B. Pump Control Panel: Furnish and install a control panel compatible with pump furnished. 230/1/60. Equal to Goulds #CB07412. Include capacitors, overload protection, relays.

2.11 WATER COOLER

Furnish and install where shown on the drawings "barrier-free" water cooler. Units shall deliver 8.0 gph of 50°F water at 90°F ambient and 80°F inlet water with stainless steel top, removable strainer, front and side push bar controls, standard finish, Flexi-Guard® Safety Bubbler, 120 volt rated at 6.0 FLA. Equal to Elkay EZH2O Model #LZO8WSLK.

PART 3 - EXECUTION

3.1 BASIC WATER PIPING SYSTEM

- A. Furnish and install the complete domestic hot water and cold water systems essentially as indicated on the drawings connecting to all fixtures and equipment requiring these services.
- B. Piping shall be new, run parallel, and graded evenly to draining points.
- C. Provide 1/2-inch drain valves at each low point in each piping system so that all parts of each system can be drained.
- D. No plumbing fixtures, devices, or piping shall be installed which will provide a cross or inter-connection between a distributing supply for a drinking water system or domestic water system and a polluted supply or drainage system or plant water system.
- E. Changes in pipe sizes shall be made with reducing fittings.
- F. Piping shall run as high and as close as possible and parallel to the walls, or as shown.
- G. Escutcheons shall be used for all insulated pipes passing through walls and finished spaces.
- H. No water pipe shall be installed outside of the building or in an exterior wall unless adequate provision is made to protect such pipe from freezing.

- I. The Contractor under this section shall make all final water connections to all equipment requiring these services that are furnished under other sections of this specification or furnished by the Owner, all as shown on the drawings. Connections shall include shut-off valves, flow restrictors, vacuum breakers, unions, and such other trim as hereinafter specified.
- J. Exposed water piping in toilets shall be chromium plated I.P.S. copper or brass pipe or tubing and fittings. Valves on exposed water piping in toilets shall be chromium plated brass or bronze.
- K. Provide ball valve at base of all domestic water risers and stop and check valves on all supplies to thermostatic mixing and shower valves, and ball and check valves on all circulating hot water return branches to main.
- L. Provide shock absorbers, chains, anchors, guides and expansion loops or joints as indicated or otherwise required to control pipe movement and any water hammer noise.

3.2 DOMESTIC COLD WATER

- A. The building cold water system shall begin 8' outside the building wall.
- B. The cold water system includes furnishing cold water main with risers, drops and branches to all fixtures and equipment.
- C. Provide suitable means to protect all water piping from water hammer.

3.3 DOMESTIC HOT WATER SYSTEM

- A. The main hot water system shall include connecting hot water and cold water piping to hot water heaters as shown on plans, hot water supply mains with risers and branches to all fixtures and equipment.
- B. Hot water piping shall be kept at least 6 inches away from cold water lines.
- C. Provide suitable means for thermal expansion for all hot water piping, using swing joints, expansion loops and long offsets, as required.
- D. Vent all high points in the hot water system. All hot water piping shall be pitched up toward fixtures and risers for proper air relief. (Fixture supplies shall be considered vents.)
- E. Provide a suitable means to protect all water piping from water hammer.

3.4 WATER SYSTEM PUMP AND ACCESSORIES

- A. Furnish and install the submersible deep well pump and all accessories as specified and shown on the drawings.
- B. Furnish pipe as shown on the drawings from the pump to the mechanical room.
- C. The Plumber is responsible for furnishing and installing the submersible cable in the well including the connection to the pump. The Electrical Contractor will furnish and install the conductor from the building to the well cap and make the final connection in the well cap. Provide One (1) - #12 bare copper grounding conductor in addition to the submersible cable from the pump to the well cap.

3.5 WATER QUALITY AND SYSTEM STERILIZATION

- A. Flush the finished well and system piping prior to sterilization.
- B. Add sodium hypochlorite (Clorox) to the well at the rate of 4 oz. to every 10' of water depth. This mixture should stand in the well for a minimum of two hours.
- C. Each water outlet in the system should be opened and allowed to run until a chlorine residual is detected. Add additional sodium hypochlorite if necessary.
- D. The system shall be left for 24 hours filled with the chlorine solution. After this time the system shall be thoroughly flushed to remove all residual chlorine.
- E. A water sample shall be taken and tested by the Maine Department of Health and Engineering. Send test samples in the name of the Owner for full bacteriological, organic, chemical, and physical quality. Provide test results to the Owner for his records.

SECTION 22 13 00
SANITARY SYSTEM

PART 1 - GENERAL

1.1 **SCOPE**

The work under this section shall include all labor and material to install a sanitary soil, waste, and drainage system as shown on the drawings or specified herein or both.

1.2 **GENERAL CONDITIONS**

Refer to General Provisions, Section 22 00 00 for provisions affecting work in this section.

1.3 **WORK INCLUDED**

- A. The work covered by this section of the specifications shall include, but is not limited to, the following:
 - 1. Fixtures connected (whether supplied or not).
 - 2. Piping, hangers, sleeves, cleanouts, vents, fittings, traps, controls, etc., required completing the system.
 - 3. Floor waste system including traps.
 - 4. Sanitary drainage and venting system to 5'-0" outside wall.
- B. The following work, which is incidental to the installation will be executed by the Contractor:
 - 1. Execute all required masonry and carpentry work, cutting, patching, furrings, plastering, etc., except as herein noted.
 - 2. Execute all required excavation work, backfilling, grading, etc. for water, drains, sewers, storm water, etc.
 - 3. Finished painting of piping supports and insulation, except as herein noted.
 - 4. Sanitary drainage system from 5'-0" outside wall to town system.
 - 5. Fixture ventilation.
 - 6. Access panels in ceiling and walls for access to cleanouts valves, etc.

PART 2 - PRODUCTS

2.1 **BASIC MATERIALS AND METHODS**

Unless otherwise indicated, the materials to be furnished under this contract shall be standard products of manufacturers regularly engaged in the production of such equipment, and shall be the manufacturer's latest standard design that complies with the specification requirements.

2.2 **SANITARY SYSTEM**

- A. All sanitary soil, waste and vent piping and fittings below lowest floor, in earth or concrete, shall be PVC or no-hub cast iron. All pipe and fittings used for drain, waste and vent piping shall conform to requirements of Maine State Plumbing Code for material and gauge.
- B. All joints for PVC pipe shall be secured only with solvent cement that is recommended by the pipe manufacturer.

- C. Sanitary soil, waste and vent piping systems above lowest floor may be CPVC (140°F or above), PVC or Tyler cast iron, no-hub, CISPT standard 301-72, bitumastic coated.
- D. Acid-resisting pipe and fittings shall be G.S.P. Fuseal F.R. polypropylene.

2.3 FLOOR DRAINS

- A. Drains shall be provided and installed with all waste and vent connections. All floor drains shall be provided in accordance with the drawings. Each floor drain shall have deep seal trap.
- B. All of the floor drains shall be installed in an approved manner, finished surfaces protected during construction and set level and installed as recommended by manufacturer.
- C. All surfaces, grates, buckets, etc., shall be cleaned and all construction dirt and stains removed at completion of project.
- D. All floor drains not installed in slab on grade shall be furnished with clamping collars.
- E. Floor drains shall be PVC with 6" dia. equivalent to Zurn #Z400 Type B with round adjustable Nickel-Bronze strainer top, square heel proof opening and secured grate, unless otherwise specified on the drawings.
- F. Floor drain or similar traps directly connected to the drainage system and subject to infrequent use shall be protected with a trap seal primer. Trap seal primers shall be accessible for maintenance.

PART 3 - EXECUTION

3.1 SOIL AND WASTE SYSTEM

- A. Furnish and install complete drainage system inside the buildings essentially as indicated on the drawings, connecting to all fixtures, drain and equipment.
- B. Soil, waste, and vent conductor piping inside the building shall be run as indicated on the drawings, properly secured to the building structure with iron hangers. Extend to roof all lines of soil, waste and vent piping in stacks with all branches and fittings required and with extension through roofs as required by the Plumbing Code, a minimum of 36 inches above the finished roof level. Where an end circuit vent pipe from any fixture or line is connected to a vent line serving other fixtures, the connection shall be at least three feet above the highest fixture branch or high enough above the floor to prevent the use of the vent line as a waste line.
- C. All fixtures and drains on the sanitary system shall be separately trapped and all traps shall be vented, unless otherwise indicated on the drawings for fixtures or drains in battery ventilation systems.
- D. All traps and running traps where buried in or under floors or serving floor drains shall have top clean-outs and extensions, with brass covers.

3.2 INSTALLATION AND WORKMANSHIP

- A. All plumbing work must be installed in accordance with plans and specifications except as otherwise required by local and State requirements. This Contractor shall obtain and pay for all necessary permits, licenses and fees in accordance with installation of services.

- B. All piping shall be located approximately as shown. Slight relocations will be permitted to improve function, clearance, and appearance.
- C. Pitch sanitary, waste and vent piping 1/4" per foot or as indicated. Conceal all piping where possible.

SECTION 22 40 00
PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SCOPE

The work under this section shall include all labor and material to install all fixtures as shown on the drawings or specified herein or both.

1.2 GENERAL CONDITIONS

Refer to General Provisions Section 22 00 00 for provisions affecting work in this section.

1.3 PROTECTION

The Plumbing Contractor shall protect all fixtures from damage during construction, furnish board enclosures for all water closets, urinals, lavatories and sinks and protect all enameled surfaces with pasted on paper. No fixtures shall be used prior to acceptance.

PART 2 - PRODUCTS

2.1 MATERIALS

Fittings and Trim shall be chrome-plated brass and unless otherwise specified and shall be of same manufacture as fixtures, including traps, flow restrictors, supplies, stops, and union connections. Any chrome trim with wrench marks shall be removed and new trim installed.

2.2 FIXTURES

- A. All fixtures shall be free from all imperfections, smooth watertight and complete in every respect.
- B. Where specified, fixtures of American-Standard Manufacturer of description and quality listed, or equivalent, shall be furnished and installed complete with all wall hangers, stops, fittings and connections. See Fixture Schedule on Plans.

2.3 FIXTURE SUPPORTS

- A. Provide acceptable foot supported carriers for all wall-hung fixtures except where noted on plans. Carriers shall be as noted on the drawings.
- B. No fixture shall be supported off the wall except where noted on plans.

PART 3 - EXECUTION

3.1 CONDITION OF SURFACES

Inspection of Roughing-In: Inspect roughing-in to see that it is in the exact position to allow fixtures to be at locations and heights indicated. Do not proceed until all positions are verified or any adjustment in fixture location is accepted by Architect/Engineer.

3.2 INSTALLATION

- A. Traps: Provide traps for all fixtures and equipment whether supplied or not, chrome-plated brass non-siphon traps shall be provided where required by the law in lieu of traps.
- B. Fixture Hangers and Stops: All fixtures supplied under this contract shall have key stops on supplies and mounting hangers or brackets for wall hung types. Also, provide key stops on supplies to all fixtures not supplied but connected under this contract.
- C. Fixture Mounting Heights: Verify all mounting heights with the Engineer.

3.3 CLEANING

Clean fixtures and trim just prior to final inspection. Clean out all strainers and aerators and adjust or replace washers to prevent leaks at faucets and stops

SECTION 23 00 00
HEATING, VENTILATION, AND AIR CONDITIONING

PART 1 - GENERAL

1.1 **GENERAL CONDITIONS OF THE CONTRACT**

All of the provisions of the General Conditions, Information for Bidders, Special Provisions of the General Contract are a part of this section. The Contractor should be familiar with these sections of the project.

1.2 **SCOPE OF WORK**

The Contractor shall furnish all labor and materials to complete all heating and ventilating work as shown on the drawings or herein specified, or both. The drawings do not show all the details for the pipes, valves, fittings, hangers, ductwork, and equipment to be used for complete installation, but show general arrangement and extent of the work to be performed. Included in this Contractor's work (but not limited to) are:

- A. Grilles, Registers and Ductwork.
- B. Piping and supports.
- C. Ventilation Fans and Ductwork.
- D. Cut all holes for walls, floors, and ceilings as required.

1.3 **RECORD DRAWINGS**

- A. This Contractor shall maintain at site two separate sets of black line prints of the Mechanical Drawings. As the work progresses, he shall mark neatly and accurately all changes from the original layouts and the work accomplished day by day. Colors shall be used in marking the various services.
- B. These sets of prints will be inspected and considered a guide to determining the amount of work installed. If these drawings are found inaccurate or incomplete, they shall be corrected promptly. This procedure is mandatory, and the Engineer will not review requisitions for payment until satisfied that this has been complied with and is up-to-date.
- C. These "As Built" drawings shall be turned over to the Engineer upon completion of the project for preparation of reproducibles by the Engineer for the Owners.
- D. Final payment will not be made until these "As Built" drawings have been received and accepted.

1.4 **SPECIAL CONDITIONS**

- A. All materials shall be new and of the latest design of the respective manufacturers. All materials and equipment of the same classification shall be of the same manufacture unless otherwise specified.
- B. Codes constitute minimum requirements. If a higher standard is specified, the higher standard shall supersede the code requirements. Any conflicts shall be resolved to the satisfaction of the Engineer before proceeding with construction. The latest edition of the Standards for the Installation of Oil Burning Equipment, State of Maine Department of Insurance and all other applicable codes shall be the standard for this project. Interpretations of these codes must be acceptable to the Engineer.

- C. Specification by brand name, manufacturer, or type is to establish standards of quality and style. Under the contract these materials shall be furnished as specified unless a change has been approved by the Project Engineer. Where two or more designations are listed, the Contractor may select at his option.
- D. Drawings shall be considered as though part of the specifications. All information contained on the drawings supplied by the Engineer shall be as though it were written in these specifications, subject to the following:
 - 1. Drawings are not to be scaled for dimensions.
 - 2. Layouts are not absolute. It is subject to minor changes to facilitate installation.
 - 3. Locations are not exact but are as close as clear drafting practice will allow. Field verification with the Engineer or his designated representative shall be the responsibility of this Contractor.
 - 4. This Contractor shall keep fully informed on the space and position requirements of his work and shall give information to the Contractor to allow coordination with other trades. Particular attention shall be paid to proper clearance from other pipes, electrical conduit, etc., as well as any other structural components.
 - 5. A set of AS-BUILT DRAWINGS, clean and clearly marked in red, shall be kept on the job at all times and turned over to the Engineer upon completion of the project.

1.5 SUBSTITUTIONS

- A. Any proposal for substitution shall be made in writing by the Contractor who shall submit full details for consideration and obtain written approval of the Engineer. The Engineer's decision as to acceptability of the substitute material or equipment shall be final. Approval by the Engineer for such substitutions shall not relieve the Contractor from responsibility regarding a satisfactory installation of such work in accordance with the intent of the plans and specifications and shall not affect his guarantee covering all parts of the work.
- B. Any additional cost resulting from the substitution of equipment shall be paid by this Contractor.

1.6 CO-ORDINATION WITH OTHER TRADES

This Contractor shall be responsible for the co-ordination of his work with the electrical and plumbing contractors and shall make the necessary adjustments and changes to facilitate installation of all ducts, conduits, and piping in the spaces available.

1.7 PROTECTION OF WORK

This Contractor shall assume full responsibility for the care and protection of all materials and mechanical work until the project is accepted by the Owner. Any material damaged or destroyed shall be immediately removed from the premises and replaced with equipment in full compliance with the specification without expense to the Owner.

1.8 OBJECTIONABLE NOISE AND VIBRATION

Mechanical equipment shall operate without objectionable noise and vibration. Should objectionable noise or vibration be transmitted to any occupied part of the building by apparatus, piping or ducts, as determined by the Engineer, the necessary changes eliminating the noise or vibration shall be made by the Contractor at no extra cost to the Owner.

1.9 ORDINANCES, PERMITS AND FEES

The Contractor shall obtain all licenses or permits, pay all fees, and comply with all local and state rules and regulations as well as those of the National Board of Fire Underwriters.

1.10 INSURANCE: See General Conditions and Special Provisions of the General Contract.

1.11 STATEMENT OF INTENT

It is the intent of the drawings and specifications to provide for the installation of an H.V.A.C. system that is safe, quiet, and economical in operation and complete in all respects.

PART 2 - PRODUCTS AND MATERIALS

2.1 PIPING

- A. Condensate Drain Piping Schedule 40 PVC plastic pipe and fittings with solvent-welded joints.
- B. Pipe Sleeves - Schedule 40 black iron through masonry. 18 Gage galvanized steel or heavier in stud wall construction.
- C. Refrigerant – Type-L (ACR) hard drawn copper tubing, washed and capped.

2.2 VENTILATION FANS

Furnish and install ventilation exhaust fans sized and located as called for in the schedules on the drawings.

2.3 FIRE DAMPERS

Shall have fusible links rated at 212°F. The dampers shall be UL approved for use in fire assemblies with ratings up to 2 hours. Equal to Ruskins Mfg. Type CR or C. Provide access panels to all fire dampers. (Ruskins ADH-1)

2.4 VENTILATION DUCTWORK

Ductwork shall be of galvanized sheet metal and shall be new copper-bearing sheets of lock-forming quality. Zinc coating that will flake or peel under any forming operation, or laminated sheets will not be allowed. Thickness of metal for rectangular ducts, including elbows and other details, shall be as follows:

Longest Rectangular Dimension of Duct Inches	Thickness Galv. Steel USS Gauge
Up thru 12	26
13 thru 30	24
31 thru 54	22
55 thru 84	20

Ductwork shall be reinforced in accordance with the latest SMACNA Duct Construction Standards – Metal and Flexible. All dampers and deflectors shall be #22 gauge and stiffened as required.

2.5 DAMPERS AND ACTUATORS

Intake air and exhaust air control dampers, as indicated on plans, to have 16 gage galvanized steel parallel blades with neoprene seals, compressible metal jamb seals and concealed linkage equal to Ruskin™ #CD36 with Belimo™ #LF24-S direct coupled damper actuator.

PART 3 - EXECUTION

3.1 PIPING - GENERAL

- A. Provide and install the piping shown on the plans and as required to complete the intended installation. The Contractor shall make such off-sets as are shown or required to place all piping in proper position to avoid other work (especially other piping and electrical).
- B. The size and general arrangements, as well as the methods of connecting all piping, valves, equipment, etc., shall be as indicated, or as approved by the Engineer.
- C. All piping shall be erected to provide for the easy and noiseless passage of water under all working conditions. Inverted eccentric reducing fittings shall be used wherever hot water pipes reduce in size. Provide 1/2" ball valves with hose couplings for drains at all low points in the piping system.
- D. All water mains shall be run level or pitch slightly upward so that no air pockets are formed in the piping. The mains shall be set at elevations such that the runouts feeding heating equipment shall have no pockets where air can collect or where vents are provided.
- E. Pipe Hangers: Shall be provided at maximum intervals of ten feet, for horizontal pipes. Hangers shall be as shown on plans or equivalent, with Engineer's approval. Vertical pipes shall be supported by adjustable malleable iron brackets.
- F. Pipe Sleeves: Furnish and install pipe sleeves for heating pipes passing through walls and ceilings. All pipe sleeves shall be sized to permit continuous pipe insulation to pass through.
- G. Escutcheons: Furnish and install chrome steel escutcheons plates in all finished areas where piping passes through walls or ceiling.

3.2 SHEET METAL AND DUCTWORK

- A. General - Furnish and install all required sheet metal work and duct systems including: intake ducts, back-draft dampers, weatherhoods, turning vanes, deflectors, operators, louvers and screens, grilles, registers, diffusers, collars, sleeves, stop-offs, baffles, acoustic linings, access doors, flexible connections, supports, etc., for the complete installation as shown on the drawings or noted herein, or required to make the installation complete in accordance with the intent of the drawings and specifications.
- B. Installation: Fabricate and install in accordance with applicable requirements of the ASHRAE Guide and Data Book. Ductwork shall be neat, accurate, rigidly constructed and mechanically tight, as well as substantially airtight and shall provide quiet system of air transportation. Offsets of exposed ductwork shall be made on sides opposite to walls, and ceilings, unless otherwise shown on the drawings or specified. Sizes, as marked on the plans, shall be adhered to as closely as possible. The right is reserved to vary the size of ducts and flues to accommodate structural conditions during the progress of the work, without additional cost to the owner.
- C. All Joints in sheet metal ducts shall be sealed and made airtight and all branches, turns, etc., shall be made with long radius elbows and fittings or shall be provided with fixed air foil turning vanes designed to reduce the resistance of the elbow to the equivalent of a long radius

elbow with a throat radius of not less than duct width. Turning vanes shall be Tuttle & Bailey's Ducturns or approved equal.

- D. All ducts shall be installed with necessary offsets, changes in cross sections, etc., and shall be constructed with approved joints and be substantially supported in an approved manner. Ductwork shall have no standing seams.
- E. Access Doors: Shall be installed in building construction, casings, plenum chambers and ducts where shown and wherever else required for ready access to operating parts of any kind.
- F. Registers, Grilles, Diffusers and Louvers: Each air outlet and inlet shall be provided with finished terminal fitting as indicated and in accordance with the drawings and schedule. All items shall be as specified or an approved equal.
- G. Cleaning: Before the duct system is tested and balanced, the interior of all ducts shall be cleaned thoroughly by blowing through the system with the system fan. Cheesecloth shall be secured over each air outlet to entrain dirt and dust during this operation.
- H. Testing and Adjusting: The Contractor shall perform all testing and adjusting necessary to conform to these plans and specifications. Qualified personnel with suitable air-measuring instruments shall adjust all dampers, etc., in the duct systems, and the Contractor shall furnish a written report, in triplicate, stating the volume and velocity of air from each central air handling unit and through each diffuser, grille and register.
- I. Adjustments: After completion of the installation work called for in this specification, the Contractor and his subcontractors shall furnish necessary mechanics or engineers for the adjustment and operation of the plant, to the end that the plant may be perfectly adjusted and turned over to the owners in perfect working order. The Contractor shall further instruct the Owner's authorized representative in the care and operation of the installation providing all required framed instruction charts, directions, etc.

3.3 ELECTRICAL

Furnish and install all low voltage (less than 120 v.) wiring associated with the H.V.A.C. system and its control. All wiring shall be done by licensed electricians and be installed in accordance with the National Electric Code.

3.4 MAINTENANCE MANUALS AND OPERATING INSTRUCTION

- A. At completion of the work, the Contractor shall provide the Engineer two complete sets of operation and maintenance instructions for all heating and ventilating equipment. These shall be bound together in two notebooks for the owner.
- B. The Owner or his representative shall be completely instructed in the operation of the heating and ventilating system and all its components and advised of good and correct operating and maintenance procedures.

3.5 SYSTEM BALANCE

- A. System balancing work shall be performed by personnel, experienced in HVAC balancing techniques, using state of the art and properly calibrated instrumentation. The Contractor must obtain approval from the Engineer for the balancing program. Three (3) bound, typewritten copies of the balancing report shall be delivered to the Engineer for approval at the completion of the work. If the report is found to be incomplete or inaccurate, the affected portions shall be repeated at no additional cost.

- B. Air Balancing: Adjust the mixing damper linkages as required to provide the correct percentages of outside air.

Adjust all dampers to deliver the air quantities specified throughout the systems. Review design volume with Engineer prior to proceeding with balance. The balancing contractor shall balance to the design flow rate in each zone with all zone dampers open.

- C. The Engineer shall be notified at least one week in advance of any balancing work. The Engineer will be present to observe all, or some of, the balancing process.

SECTION 23 05 29
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Fiberglass pipe hangers.
4. Metal framing systems.
5. Fiberglass strut systems.
6. Thermal-hanger shield inserts.
7. Fastener systems.
8. Pipe stands.
9. Equipment supports.

1.3 DEFINITIONS

MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 2. Equipment:
 - a. All mechanical equipment not supported with isolators external to the unit shall be securely anchored to the structure. Such mechanical equipment shall be properly supported to resist a horizontal force of 20 percent of the weight of the equipment furnished.
 - b. All mechanical equipment mounted on vibration isolators shall be provided with seismic restraints capable of resisting a horizontal force of 50 percent of the weight of the equipment furnished.

1.5 ACTION SUBMITTALS

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

- B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:
1. Trapeze pipe hangers.
 2. Metal framing systems.
 3. Fiberglass strut systems.
 4. Pipe stands.
 5. Equipment supports.
- C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
1. Detail fabrication and assembly of trapeze hangers.
 2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.6 INFORMATIONAL SUBMITTALS

Welding certificates.

1.7 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 – PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Stainless-Steel Pipe Hangers and Supports:
1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.2 TRAPEZE PIPE HANGERS

Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 FIBERGLASS PIPE HANGERS

A. Clevis-Type, Fiberglass Pipe Hangers:

1. Description: Similar to MSS SP-58, Type 1, steel pipe hanger except hanger is made of fiberglass or fiberglass-reinforced resin.
2. Hanger Rods: Continuous-thread rod, washer, and nuts made of fiberglass.

B. Strap-Type, Fiberglass Pipe Hangers:

1. Description: Similar to MSS SP-58, Type 9 or Type 10, steel pipe hanger except hanger is made of fiberglass-reinforced resin.
2. Hanger Rod and Fittings: Continuous-thread rod, washer, and nuts made of stainless steel.

2.4 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.
 - c. Flex-Strut Inc.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut Corporation; Tyco International, Ltd.
 - g. Wesanco, Inc.
2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Hot-dipped galvanized.
8. Paint Coating: Vinyl.

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International; a subsidiary of Mueller Water Products Inc.
 - b. Empire Industries, Inc.
 - c. ERICO International Corporation.
 - d. Haydon Corporation; H-Strut Division.
 - e. NIBCO INC.
 - f. PHD Manufacturing, Inc.
 - g. PHS Industries, Inc.
2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.

6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Coating: Paint.

2.5 FIBERGLASS STRUT SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Allied Tube & Conduit.
 2. Champion Fiberglass, Inc.
 3. Cooper B-Line, Inc.
 4. SEASAFE, INC.; a Gibraltar Industries Company.
- B. Description: Shop- or field-fabricated pipe-support assembly similar to MFMA-4 for supporting multiple parallel pipes.
 1. Channels: Continuous slotted fiberglass or other plastic channel with inturned lips.
 2. Channel Nuts: Fiberglass nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
 3. Hanger Rods: Continuous-thread rod, nuts, and washer made of fiberglass.

2.6 THERMAL-HANGER SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Carpenter & Paterson, Inc.
 2. Clement Support Services.
 3. ERICO International Corporation.
 4. National Pipe Hanger Corporation.
 5. PHS Industries, Inc.
 6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
 7. Piping Technology & Products, Inc.
 8. Rilco Manufacturing Co., Inc.
 9. Value Engineered Products, Inc.
- B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) minimum compressive strength and vapor barrier.
- C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) minimum compressive strength.
- D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- F. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.7 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

- B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.8 PIPE STANDS

- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
- C. Low-Type, Single-Pipe Stand: One-piece plastic base unit with plastic roller, for roof installation without membrane penetration.
- D. High-Type, Single-Pipe Stand:
 - 1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
 - 2. Base: Plastic.
 - 3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
 - 4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.
- E. High-Type, Multiple-Pipe Stand:
 - 1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
 - 2. Bases: One or more; plastic.
 - 3. Vertical Members: Two or more protective-coated-steel channels.
 - 4. Horizontal Member: Protective-coated-steel channel.
 - 5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.
- F. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.9 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.10 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 – EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Fiberglass Pipe-Hanger Installation: Comply with applicable portions of MSS SP-69 and MSS SP-89. Install hangers and attachments as required to properly support piping from building structure.
- D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- E. Fiberglass Strut System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled fiberglass struts.
- F. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- G. Fastener System Installation:
 - 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- H. Pipe Stand Installation:
 - 1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
 - 2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb.
- I. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- J. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- K. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

- L. Install lateral bracing with pipe hangers and supports to prevent swaying.
- M. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- N. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- O. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- P. Insulated Piping:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
 - b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
 - c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
 - d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
 - e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.
 - 5. Pipes NPS 8 (DN 200) and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
 - 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05mm).
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal to match base paint type.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

- E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.
- F. Use stainless-steel pipe hangers and fiberglass pipe hangers and fiberglass strut systems and stainless-steel or corrosion-resistant attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
- H. Use padded hangers for piping that is subject to scratching.
- I. Use thermal-hanger shield inserts for insulated piping and tubing.
- J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C), pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
 - 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.
 - 5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
 - 6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of non-insulated, stationary pipes NPS 3/4 to NPS 8 (DN 20 to DN 200).
 - 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 8. Adjustable Band Hangers (MSS Type 9): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of non-insulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
 - 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of non-insulated, stationary pipes NPS 3/8 to NPS 8 (DN 10 to DN 200).
 - 11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of non-insulated, stationary pipes NPS 3/8 to NPS 3 (DN 10 to DN 80).
 - 12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
 - 13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 - 14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 - 15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 - 16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 (DN 65 to DN 900) if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.

17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.
 18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24 (DN 65 to DN 600), from single rod if horizontal movement caused by expansion and contraction might occur.
 19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
 20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 (DN 50 to DN 600) if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
 21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 (DN 50 to DN 750) if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.
- L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.
- M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.

10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb (340 kg).
 - b. Medium (MSS Type 32): 1500 lb (680 kg).
 - c. Heavy (MSS Type 33): 3000 lb (1360 kg).
 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
 8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

- R. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

SECTION 23 05 48
MECHANICAL SOUND, VIBRATION, AND SEISMIC CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vibration isolators.

1.2 REFERENCES

A. Air Movement and Control Association International, Inc.:

1. AMCA 300 - Reverberant Room Method for Sound Testing of Fans.

B. American National Standards Institute:

1. ANSI S1.4 - Sound Level Meters.
2. ANSI S1.8 - Reference Quantities for Acoustical Levels.
3. ANSI S1.13 - Methods for the Measurement of Sound Pressure Levels in Air.
4. ANSI S12.36 - Survey Methods for the Determination of Sound Power Levels of Noise Sources.

C. Air-Conditioning and Refrigeration Institute:

1. ARI 575 - Method of Measuring Machinery Sound within Equipment Space.

D. American Society of Heating, Refrigerating and:

1. ASHRAE 68 - Laboratory Method of Testing In-Duct Sound Power Measurement Procedure for Fans.
2. ASHRAE Handbook - HVAC Applications.

E. American Society for Testing and Materials:

1. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

F. Sheet Metal and Air Conditioning Contractors':

1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

1.3 PERFORMANCE REQUIREMENTS

A. Provide vibration isolation on motor driven equipment over **0.5 hp**, plus connected piping and ductwork.

B. Provide minimum static deflection of isolators for equipment as follows:

1. Basement, Under 20 hp
 - a. 400 - 600 rpm: 1 inch
 - b. 600 - 800 rpm: 0.5 inch

- c. 800 - 900 rpm: 0.2 inch
 - d. 1100 - 1500 rpm: 0.14 inch
 - e. Over 1500 rpm: 0.1 inch
 - 2. Upper Floors, Normal
 - a. 400 - 600 rpm: 3.5 inch
 - b. 600 - 800 rpm: 2 inch
 - c. 800 - 900 rpm: 1 inch
 - d. 1100 - 1500 rpm: 0.5 inch
 - e. Over 1500 rpm: 0.2 inch
 - C. Maintain sound level of spaces at levels not to exceed those listed below by utilizing acoustical devices.
 - D. Maintain rooms at following maximum sound levels, in Noise Criteria (NC) as defined by ASHRAE Handbook, HVAC Applications and ANSI S1.8.
- 1.4 QUALITY ASSURANCE
- A. Perform Work in accordance with AMCA 300 and ANSI S1.13 standards and recommendations of ASHRAE 68.
 - B. Maintain one copy of each document on site.
- 1.5 QUALIFICATIONS
- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
 - B. Installer: Company specializing in performing Work of this section with minimum three years experience.
- 1.6 PRE-INSTALLATION MEETINGS
- A. Convene minimum one week prior to commencing work of this section.
- 1.7 FIELD MEASUREMENTS
- A. Verify field measurements prior to fabrication.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

- A. Manufacturers:
 - 1. Vibration Isolators Inc. or equivalent.
- B. Open Spring Isolators:
 - 1. Spring Isolators:
 - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
 - 2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.

3. Spring Mounts: Furnish with leveling devices, minimum 0.25-inch thick neoprene sound pads, and zinc chromate plated hardware.
 4. Sound Pads: Size for minimum deflection of 0.05 inch; meet requirements for neoprene pad isolators.
- C. Restrained Spring Isolators:
1. Spring Isolators:
 - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
 2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
 3. Spring Mounts: Furnish with leveling devices, minimum 0.25-inch thick neoprene sound pads, and zinc chromate plated hardware.
 4. Sound Pads: Size for minimum deflection of 0.05 inch; meet requirements for neoprene pad isolators.
 5. Restraint: Furnish mounting frame and limit stops.
- D. Closed Spring Isolators:
1. Spring Isolators:
 - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
 2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
 3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
 4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25-inch clearance.
- E. Restrained Closed Spring Isolators:
1. Spring Isolators:
 - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
 2. Type: Closed spring mount with top and bottom housing separated with neoprene rubber stabilizers.
 3. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
 4. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators, and neoprene side stabilizers with minimum 0.25-inch clearance and limit stops.
- F. Spring Hanger:
1. Spring Isolators:
 - a. For Exterior and Humid Areas: Furnish hot dipped galvanized housings and neoprene coated springs.
 - b. Code: Color code springs for load carrying capacity.
 2. Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 0.3 and 0.6 of maximum deflection.
 3. Housings: Incorporate neoprene isolation pad meeting requirements for neoprene pad isolators and rubber hanger with threaded insert.

4. Misalignment: Capable of 20 degree hanger rod misalignment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify equipment, ductwork and piping is installed before work in this section is started.

3.2 EXISTING WORK

- A. Provide access to existing piping and ductwork and other installations remaining active and requiring access.
- B. Extend existing piping and ductwork installations using materials and methods compatible with existing electrical installations.

3.3 INSTALLATION

- A. Install isolation for motor driven equipment.
- B. Adjust equipment level.
- C. Install spring hangers without binding.
- D. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.
- E. Provide pairs of horizontal limit springs on fans with more than 3.0-inch static pressure, and on hanger supported, horizontally mounted axial fans.
- F. Provide resiliently mounted equipment, piping, and ductwork with seismic snubbers. Provide each inertia base with minimum of four seismic snubbers located close to isolators. Snub equipment designated for post disaster use to 0.05-inch maximum clearance. Provide other snubbers with clearance between 0.15 inch and 0.25 inch.

3.4 FIELD QUALITY CONTROL

- A. Inspect isolated equipment after installation and submit report. Include static deflections.
- B. After start-up, final corrections and balancing of systems take octave band sound measurements over full audio frequency range in areas adjacent to mechanical equipment rooms, duct and pipe shafts, and other critical locations. Provide one-third octave band measurements of artificial sound sources in areas indicated as having critical requirements. Submit complete report of test results including sound curves.
- C. Furnish services of testing agency to take noise measurement. Use meters meeting requirements of ANSI S1.4.

SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1- GENERAL

1.1 SUMMARY

Section includes testing, adjusting, and balancing of air systems, testing, adjusting, and balancing of hydronic systems, measurement of final operating condition of HVAC systems, sound measurement of equipment operating conditions, vibration measurement of equipment operating conditions.

1.2 REFERENCES

- A. AABC (Associated Air Balance Council) - National Standards for Total System Balance.
- B. ASHRAE 111 (American Society of Heating, Refrigerating and Air-Conditioning Engineers) - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.
- C. NEBB (National Environmental Balancing Bureau) - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

1.3 SUBMITTALS

- A. Test Reports: Indicate data on AABC National Standards for Total System Balance forms, forms prepared following ASHRAE 111, or NEBB Report forms.
- B. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- C. Prior to commencing Work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.
- D. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.
- E. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets and indicating thermostat locations.
- F. Include detailed procedures, agenda, sample report forms and copy of AABC National Project Performance Guaranty or Copy of NEBB Certificate of Conformance Certification.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with AABC National Standards for Field Measurement and Instrumentation, Total System Balance, ASHRAE 111 or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems
- B. Maintain one copy of each document on site.

1.5 QUALIFICATIONS

- A. Agency: Company specializing in the testing, adjusting, and balancing of systems specified in this section with minimum three years documented experience certified by AABC or Certified by NEBB.
- B. Perform Work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor, or registered professional engineer experienced in performance of this Work and licensed in the State of Maine.

1.6 PRE-INSTALLATION MEETING

Convene minimum one week prior to commencing Work of this section.

1.7 SEQUENCING

Sequence balancing between completion of systems tested and Date of Substantial Completion.

1.8 SCHEDULING

Schedule and provide assistance in final adjustment and test of life safety system with Fire Authority.

PART 2 – PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fans are rotating correctly.
 - 7. Fire and volume dampers are in place and open.
 - 8. Air coil fins are cleaned and combed.
 - 9. Access doors are closed, and duct end caps are in place.
 - 10. Air outlets are installed and connected.
 - 11. Duct system leakage is minimized.
- B. Submit field reports. Report defects and deficiencies noted during performance of services, which prevent system balance.

3.2 PREPARATION

Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

3.3 INSTALLATION TOLERANCES

- A. Air Handling Systems: Adjust to within plus 5 percent or minus 0 percent of design.
- B. Air Outlets and Inlets: Adjust total to within plus 5 percent and minus 0 percent of design to space. Adjust outlets and inlets in space to within plus or minus 5 percent of design.
- C. Hydronic Systems: Adjust to within plus or minus 5 percent of design.

3.4 ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.
- F. Check and adjust systems approximately six months after final acceptance and submit report.

3.5 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.
- B. Make air quantity measurements in main ducts by Pitot tube traverse of entire cross-sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts.
- E. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide sheave drive changes as required to vary fan speed. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure.

3.6 SCHEDULES

A. Equipment Requiring Testing, Adjusting, and Balancing

- 1. Packaged Terminal Air Conditioning Units
- 2. Air Coils
- 3. Energy Recovery Units
- 4. Fans
- 5. Air Terminal Units
- 6. Air Inlets and Outlets

B. Report Forms

- 1. Title Page:
 - a. Name of Testing, Adjusting, and Balancing Agency
 - b. Address of Testing, Adjusting, and Balancing Agency
 - c. Telephone and facsimile numbers of Testing, Adjusting, and Balancing Agency
 - d. Project name
 - e. Project location
 - f. Project Architect
 - g. Project Engineer
 - h. Project Contractor
 - i. Project altitude
 - j. Report date
- 2. Summary Comments:
 - a. Design versus final performance
 - b. Notable characteristics of system
 - c. Description of systems operation sequence
 - d. Summary of outdoor and exhaust flows to indicate amount of building pressurization
 - e. Nomenclature used throughout report
 - f. Test conditions
- 3. Instrument List:
 - a. Instrument
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Range
 - f. Calibration date
- 4. Electric Motors:
 - a. Manufacturer
 - b. Model/Frame
 - c. HP/BHP and kW
 - d. Phase, voltage, amperage; nameplate, actual, no load
 - e. RPM
 - f. Service factor
 - g. Starter size, rating, heater elements
 - h. Sheave Make/Size/Bore

5. V-Belt Drive:
 - a. Identification/location
 - b. Required driven RPM
 - c. Driven sheave, diameter, and RPM
 - d. Belt, size, and quantity
 - e. Motor sheave diameter and RPM
 - f. Center to center distance, maximum, minimum, and actual
6. Air Moving Equipment
 - a. Location
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Arrangement/Class/Discharge
 - f. Air flow, specified and actual
 - g. Return air flow, specified and actual
 - h. Outside air flow, specified and actual
 - i. Total static pressure (total external), specified and actual
 - j. Inlet pressure
 - k. Discharge pressure
 - l. Sheave Make/Size/Bore
 - m. Number of Belts/Make/Size
 - n. Fan RPM
7. Return Air/Outside Air Data:
 - a. Identification/location
 - b. Design air flow
 - c. Actual air flow
 - d. Design return air flow
 - e. Actual return air flow
 - f. Design outside air flow
 - g. Actual outside air flow
 - h. Return air temperature
 - i. Outside air temperature
 - j. Required mixed air temperature
 - k. Actual mixed air temperature
 - l. Design outside/return air ratio
 - m. Actual outside/return air ratio
8. Exhaust Fan Data:
 - a. Location
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Air flow, specified and actual
 - f. Total static pressure (total external), specified and actual
 - g. Inlet pressure
 - h. Discharge pressure
 - i. Sheave Make/Size/Bore
 - j. Number of Belts/Make/Size
 - k. Fan RPM
9. Duct Traverse:
 - a. System zone/branch
 - b. Duct size
 - c. Area
 - d. Design velocity
 - e. Design air flow

- f. Test velocity
- g. Test air flow
- h. Duct static pressure
- i. Air temperature
- j. Air correction factor
- 10. Duct Leak Test:
 - a. Description of ductwork under test
 - b. Duct design operating pressure
 - c. Duct design test static pressure
 - d. Duct capacity, air flow
 - e. Maximum allowable leakage duct capacity times leak factor
 - f. Test apparatus
 - 1. Blower
 - 2. Orifice, tube size
 - 3. Orifice size
 - 4. Calibrated
 - g. Test static pressure
 - h. Test orifice differential pressure
 - i. Leakage
- 11. Flow Measuring Station:
 - a. Identification/number
 - b. Location
 - c. Size
 - d. Manufacturer
 - e. Model number
 - f. Serial number
 - g. Design Flow rate
 - h. Design pressure drop
 - i. Actual/final pressure drop
 - j. Actual/final flow rate
 - k. Station calibrated setting
- 12. Air Distribution Test Sheet:
 - a. Air terminal number
 - b. Room number/location
 - c. Terminal size
 - d. Design velocity
 - e. Design air flow
 - f. Test (final) velocity
 - g. Test (final) air flow
 - h. Percent of design air flow
- 13. Sound Level Report:
 - a. Location
 - b. Octave bands - equipment off
 - c. Octave bands - equipment on
 - d. RC level – equipment on
- 14. Normally acceptable readings, velocity, and acceleration.

SECTION 23 07 00
HVAC INSULATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Insulation Materials:
 - a. Flexible elastomeric.
 - b. Mineral fiber.
 - 2. Insulating cements.
 - 3. Adhesives.
 - 4. Lagging adhesives.
 - 5. Sealants.
 - 6. Factory-applied jackets.
 - 7. Field-applied jackets.
 - 8. Tapes.
 - 9. Securements.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets.
- B. Qualification Data: For qualified Installer.
- C. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed a program or another craft training program.
- B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application, duct Installer for duct insulation application, and equipment Installer for equipment insulation application. Before preparing piping and ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. If utilized, coordinate installation and testing of heat tracing.

1.7 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Aeroflex USA Inc.; Aerocel.
 - b. Armacell LLC; AP Armaflex.
 - c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.
- D. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corp.; Duct Wrap.
 - b. Johns Manville; Microlite.
 - c. Knauf Insulation; Duct Wrap.

- d. Owens Corning; All-Service Duct Wrap.
- E. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. For equipment applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory- Applied Jackets" Article.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corp.; Commercial Board.
 - b. Johns Manville; 800 Series Spin-Glas.
 - c. Knauf Insulation; Insulation Board.
 - d. Owens Corning; Fiberglas 700 Series.
- F. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Johns Manville; Micro-Lok.
 - b. Knauf Insulation; 1000 Pipe Insulation.
 - c. Owens Corning; Fiberglas Pipe Insulation.
 - 2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- G. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. CertainTeed Corp.; CrimpWrap.
 - b. Johns Manville; MicroFlex.
 - c. Knauf Insulation; Pipe and Tank Insulation.
 - d. Owens Corning; Fiberglas Pipe and Tank Insulation.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
- B. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

- D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

2.4 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
 - 1. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct, equipment, and pipe insulation.
 - 2. Service Temperature Range: Minus 50 to plus 180 deg F.
 - 3. Color: White.

2.5 SEALANTS

- A. Joint Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Permanently flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 100 to plus 300 deg F.
 - 4. Color: White or gray.
- B. FSK and Metal Jacket Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 4. Color: Aluminum.
- C. ASJ Flashing Sealants, and PVC Jacket Flashing Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Fire- and water-resistant, flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 - 4. Color: White.

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2.7 FIELD-APPLIED JACKETS

- A. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Johns Manville; Zeston.
 - b. P.I.C. Plastics, Inc.; FG Series.
 - c. Proto PVC Corporation; LoSmoke.
 - d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

2.8 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
- B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

2.9 SECUREMENTS

- A. Bands:
 1. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing or closed seal.
- B. Insulation Pins and Hangers:
 1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
 2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
 - a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.
- C. Wire: 0.062-inch soft-annealed, galvanized steel.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
 1. Verify that systems and equipment to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment, ducts and fittings, and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment, duct system, and pipe system as specified in

insulation system schedules.

- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints, and at ends adjacent to duct and pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation less than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Manholes.
 - 5. Handholes.
 - 6. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 - 4. Seal jacket to wall flashing with flashing sealant.
- B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
- D. Insulation Installation at Floor Penetrations:
 - 1. Duct: Install insulation continuously through floor penetrations that are not fire rated. For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
 - 2. Pipe: Install insulation continuously through floor penetrations.
 - 3. Seal penetrations through fire-rated assemblies.

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and

- irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless- steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical centerline of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent

pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
 1. Install pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
 1. Install mitered sections of pipe insulation.
 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
 1. Install preformed valve covers manufactured of same material as pipe insulation when available.
 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 3. Install insulation to flanges as specified for flange insulation application.
 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 MINERAL-FIBER INSULATION INSTALLATION

- A. Insulation Installation on Straight Pipes and Tubes:
 1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
 4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

E. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not over compress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1-inch o.c.

Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

- a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.
 5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
- F. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor- discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not over compress insulation during installation.
 - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1-inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.
 5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct

- elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.8 FIELD-APPLIED JACKET INSTALLATION

- A. Where jackets are indicated, install as follows:
1. Draw jacket material smooth and tight.
 2. Install lap or joint strips with same material as jacket.
 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

3.9 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
1. Indoor supply ducts.
 2. Outdoor-air supply ducts.
 3. Outdoor-air and Exhaust air plenums.
 4. Energy Recovery Unit exhaust duct between unit outlet and penetration of building exterior.
 5. General Exhaust ducts between isolation damper and penetration of building exterior.
- B. Items Not Insulated:
1. Factory-insulated flexible ducts.
 2. Factory-insulated plenums and casings.
 3. Flexible connectors.
 4. Vibration-control devices.
 5. Factory-insulated access panels and doors.
 6. Indoor, concealed return ducts.
 7. Indoor, concealed exhaust ducts; except downstream of energy recover equipment.
 8. Exposed supply and return ducts within conditioned spaces.

3.10 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Supply and return air duct insulation installed above surfaced ceiling cavity shall be the following:
1. Mineral-Fiber: 2 inches thick and 0.75-lb/cu. ft. nominal density, and equal to R-12.
- B. Outdoor-air duct insulation shall be the following:
1. Mineral-Fiber Blanket: 2 inches thick and 0.75-lb/cu. ft. nominal density.
- C. Outdoor-air, Supply-air, return air, and exhaust-air insulation shall be the following:
1. Mineral-Fiber: 2-lb/cu. ft. nominal density. Equal to R-12.

D. General Exhaust-air duct insulation within 10 ft of penetration of building exterior shall be the following:

1. Mineral-Fiber Blanket: 2 inches thick and 0.75-lb/cu. ft. nominal density.

3.11 INDOOR PIPING INSULATION SCHEDULE

A. Condensate Drains and Equipment Drain Water:

1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 3/4 inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

B. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:
 - a. Flexible Elastomeric: 1 inch thick.

3.12 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Refrigerant Suction and Hot-Gas Piping:

1. All Pipe Sizes: Insulation shall be the following:
 - a. Flexible Elastomeric: 1-1/2 inches thick with UV resistant outer sleeve.

SECTION 23 23 00
REFRIGERANT PIPING AND ACCESSORIES

PART 1 - GENERAL

1.1 **RELATED DOCUMENTS**

Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this Section.

1.2 **DESCRIPTION OF WORK**

A. General: Provide and install refrigerant piping system shown on drawings and specified in this Section. Work in this Section includes complete operating charge of refrigerant for each system.

1.3 **QUALITY OF COMPLIANCE**

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of refrigerant piping products of types, materials, and sizes required whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with refrigerant piping work similar to that required for project.
- C. Codes and Standards:
1. ANSI Compliance: Fabricate and install refrigerant piping in accordance with ANSI B31.5, "Refrigeration Piping" and extend applicable lower pressure limits to pressures below 15 psig.
 2. ASHRAE Compliance: Fabricate and install refrigerant piping in accordance with ASHRAE 15, "Safety Code for Mechanical Refrigeration".
- D. Submittals: Product Data: Submit Manufacturer's Technical Product Data and Installation Instructions for Refrigerant Piping Materials and Products. See Section 22 00 00, "Plumbing General Provisions" and 23 00 00 "Heating, Ventilation, and Air Conditioning".

PART 2 – PRODUCTS

2.1 **PIPING**

- A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with ANSI B31.5 Code for Refrigeration Piping where applicable, base pressure rating on refrigerant piping system and maximum design pressures. Provide sizes and types matching piping and equipment connections. Provide fittings of materials that match pipe materials used in refrigerant piping systems. Where more than one type of materials or products is indicated, selection is Installer's opinion.
- B. Tube Size 4-1/8" and Smaller: Copper tube, Type ACR, hard-drawn temper, wrought-copper, solder-joint fitting, and soldered joints.
- C. Soldered Joints: Solder Joints using silver-lead solder, ASTM B 32, Grade 96 TS.

- D. Braze Joints: Braze joints using American Welding Society (AWS) classification for brazing filler metal.

2.2 PIPE SUPPORTS

- A. Adjustable steel clevises, adjustable roller hangers, and adjustable pipe roll stands for horizontal piping hangers and supports.
- B. Two-bolt riser clamps for vertical piping supports.
- C. Concrete inserts, C-clamps, and steel brackets for building attachment.
- D. Protection shields for insulated piping support in hangers.
- E. Copper flashings for piping penetrations.

2.3 REFRIGERANT SPECIALTIES

- A. Globe Shutoff Valves: Forged brass, packed, back seating, winged seal cap, 300°F (149°C) temperature rating, 500 psi working pressure.
- B. Moisture-Liquid Indicators: Forged brass, single port, removable cap, polished optical glass, solder connections, UL-Listed, 200°F (93°C) temperature rating, 500 psi working pressure.
- C. Refrigerant Filter-Driers: Corrosion-resistant steel shell, steel flange ring and spring, wrought copper fittings, ductile iron cover plate with steel cap screws, replaceable filter-drier core, 500 psi working pressure.
- D. Acceptable Manufacturers:
 - 1. ALCO
 - 2. Henry Valve Company
 - 3. Sporlan Valve Company
- E. Refrigerant piping shall be insulated with closed cell elastomeric foam insulation. Material shall be 1-1/2" wall thickness and be UV resistant when installed outdoors. Equal to AP/Armaflex™ by Armacell.

PART 3 – EXECUTION

3.1 GENERAL

Examine areas and conditions under which refrigerant piping systems materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.2 INSTALLING REFRIGERANT PIPING

Install refrigerant piping with ¼" per foot (1%) downward slope in direction of coil return to compressor. Provide oil traps and double risers where indicated and where required to provide oil return.

3.3 CLEANING REFRIGERANT PIPING

Clean refrigerant piping by swabbing with dry lintless (linen) cloth, followed by refrigerant oil-soaked swab. Remove excess oil by swabbing with cloth soaked in high flash point petroleum solvent, squeezed dry.

3.4 BLEED DRY REFRIGERANT PIPING

Bleed dry nitrogen through refrigerant piping during brazing operations.

3.5 VALVES

Install refrigerant valves where indicated and in accordance with manufacturer's instructions. Remove accessible internal parts before soldering or brazing and replace after joints are completed.

3.6 SOLENOID VALVES

Install in refrigerant piping as indicated with stem pointing upwards.

3.7 CONNECTIONS

Connect refrigerant piping to mechanical equipment as indicated and comply with equipment manufacturer's instructions where not otherwise indicated.

3.8 LEAK TESTING

- A. Refrigerant Piping Leak Test: Prior to initial operation, clean and test refrigerant piping in accordance with ANSI B31.5, "Refrigeration Piping".

Perform initial test with dry nitrogen using soap solution to test all joints. Perform final test with 27" vacuum and then 200 psi using halide torch. System must be entirely leak-free.

- B. Repair or replace refrigerant piping as required to eliminate leaks and retest as specified to demonstrate compliance.

3.9 DEHYDRATION AND CHARGING SYSTEM

- A. Install core in filter dryer after leak test but before evacuation.
- B. Evacuate refrigerant system with vacuum pump until temperature of 35°F (2°C) is indicated on vacuum dehydration indicator.
- C. During evacuation, apply heat to pockets, elbows, and low spots in piping.
- D. Maintain vacuum on system for minimum of 5 hours after closing valve between vacuum pump and system.
- E. Break vacuum with refrigerant gas and allow pressure to build up to 2 psi.
- F. Complete charging of system using new filter dryer core in charging line. Provide full operating charge.

SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 **SUMMARY**

- A. Section includes back-draft dampers, duct access doors, volume control dampers, fire dampers, flexible duct connections and duct test holes.

1.2 **REFERENCES**

- A. NFPA 90A (National Fire Protection Association) - Installation of Air Conditioning and Ventilating Systems.
- B. NFPA 92A (National Fire Protection Association) - Smoke Control Systems.
- C. SMACNA (Sheet Metal Air Conditioning Contractors' National Association) - HVAC Duct Construction Standards - Metal and Flexible.
- D. UL 33 (Underwriters Laboratories, Inc.) - Heat Responsive Links for Fire-Protection Service.
- E. UL 555 (Underwriters Laboratories, Inc.) - Fire Dampers and Ceiling Dampers.
- F. UL 555S (Underwriters Laboratories, Inc.) - Leakage Rated Dampers for Use in Smoke Control Systems.

1.3 **SUBMITTALS**

- A. Refer to Section 01 33 00 - Submittal Procedures.
- B. Product Data: Submit data for shop fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.
- C. Manufacturer's Installation Instructions: Submit for Fire and Combination Smoke and Fire Dampers.

1.4 **CLOSEOUT SUBMITTALS**

- A. Refer to Section 01 77 00 - Closeout Procedures.
- B. Project Record Documents: Record actual locations of access doors test holes.
- C. Operation and Maintenance Data: Submit for Fire Dampers.

1.5 **DELIVERY, STORAGE, AND HANDLING**

- A. Protect dampers from damage to operating linkages and blades.

1.6 **FIELD MEASUREMENTS**

Verify field measurements prior to fabrication.

1.7 COORDINATION

Coordinate Work where appropriate with building control Work.

PART 2 - PRODUCTS

2.1 BACKDRAFT DAMPERS

- A. Product Description: Gravity Back-draft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturers standard construction.
- B. Multi-Blade, back-draft dampers: Parallel-action, gravity-balanced, Galvanized 16 gage thick steel, or extruded aluminum. Blades, maximum 6-inch width, with felt or flexible vinyl sealed edges. Blades linked together in rattle-free manner with 90-degree stop, steel ball bearings, and plated steel pivot pin. Provide dampers with adjustment device to permit setting for varying differential static pressure.

2.2 DUCT ACCESS DOORS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum 1-inch thick insulation with sheet metal cover.
 - 1. Less Than 12 inches square, secure with sash locks.
 - 2. Up to 18 inches Square: Provide two hinges and two sash locks.
 - 3. Up to 24 x 48 inches: Three hinges and two compression latches with outside and inside handles.
 - 4. Larger Sizes: Provide an additional hinge.

2.3 VOLUME CONTROL DAMPERS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Splitter Dampers:
 - 1. Material: Same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.
 - 2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
 - 3. Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch.
 - 4. Assemble center and edge crimped blades in prime coated or galvanized frame channel with suitable hardware;
 - 5. End Bearings: Except in round ductwork 2 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings. Provide closed end bearings on all ducts having a pressure classification over 2 inches wg;
- C. Quadrants:
 - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.

2. On insulated ducts mount quadrant regulators on standoff mounting brackets, bases, or adapters.
3. Where rod lengths exceed 30 inches provide regulator at both ends.

2.4 FIRE DAMPERS

Shall have fusible links rated at 212°F. The dampers shall be UL approved for use in fire assemblies with ratings up to 2 hours. Equal to Ruskin Type CR or C. Provide access panels to all fire dampers. (Ruskin ADH-I)

2.5 FLEXIBLE DUCT CONNECTIONS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and SMACNA for Round Industrial Ductwork.
- B. Connector: Fabric crimped into metal edging strip.
 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric conforming to NFPA 90A, minimum density 30 oz per sq yd.
 2. Net Fabric Width: Approximately 6 inches wide.
 3. Metal: 3 inch wide, 18 gage galvanized steel.
- C. Leaded Vinyl Sheet: Minimum 0.55 inch thick, 0.87 lbs. per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.
- D. On discharge: - for +2 WG static pressure.
On suction side: -for - 2 WG static pressure.
On suction side: - for - 8 WG static pressure (for exhaust tile piping).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify rated walls are ready for fire damper installation.
- B. Verify ducts and equipment installation are ready for accessories.

3.2 INSTALLATION

- A. Provide back-draft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- B. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated.
- C. Provide duct test holes where indicated and required for testing and balancing purposes.
- D. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92A.

3.3 CLEANING

- A. Vacuum clean coils and inside of unit cabinet.

- B. Install new throwaway filters in units at Substantial Completion.
- C. Ventilation units shall run two weeks before final cleaning to flush out all construction dust as required. Change all filters after final cleaning. Cleaning and unit flush out shall comply with ASHRAE Standard 62-2016 Ventilation for Acceptable Indoor Air Quality.

SECTION 23 72 00
AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

Section Includes:

1. Fixed-plate total heat exchangers.

1.3 PERFORMANCE REQUIREMENTS

Delegated Design: Design vibration isolation and seismic-restraint details, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, furnished specialties, and accessories.
- B. Shop Drawings: For air-to-air energy recovery equipment. Include plans, elevations, sections, details, and attachments to other work.
 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 2. Wiring Diagrams: For power, signal, and control wiring.
- C. Field quality-control reports.
- D. Operation and Maintenance Data: For air-to-air energy recovery equipment to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ARI Compliance: Capacity ratings for air-to-air energy recovery equipment shall comply with ARI 1060, "Rating Air-to-Air Energy Recovery Equipment."
- C. ASHRAE Compliance:
 1. Capacity ratings for air-to-air energy recovery equipment shall comply with ASHRAE 84, "Method of Testing Air-to-Air Heat Exchangers."
- D. NRCA Compliance: Roof curbs for roof-mounted equipment shall be constructed according to recommendations of NRCA.

- E. UL Compliance: Packaged heat recovery ventilators shall comply with requirements in UL 1812, "Ducted Heat Recovery Ventilators".

1.6 COORDINATION

- A. Coordinate layout and installation of air-to-air energy recovery equipment and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.
- B. Coordinate sizes and locations of concrete bases with actual equipment provided.
- C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.7 WARRANTY

Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air-to-air energy recovery equipment that fail in materials or workmanship within specified warranty period.

- 1. Warranty Period for Fixed-Plate Total Heat Exchangers: 10 years.

1.8 EXTRA MATERIALS

Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

- 1. Filters: One set(s) of each type of filter specified.
- 2. Fan Belts: One set(s) of belts for each belt-driven fan in energy recovery units.

PART 2 - PRODUCTS

2.1 FIXED-PLATE TOTAL HEAT EXCHANGERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Mitsubishi Electric Inc.
 - 2. RenewAire LLC (Basis of Design).
 - 3. Nu-Air.
- B. Performance and Configuration: As Scheduled on the Drawings.
- C. Casing: Galvanized steel.
- D. Plates: Evenly spaced and sealed and arranged for counter airflow.
 - 1. Plate Material: Chemically treated paper with selective hydroscopicity and moisture permeability, and gas barrier properties.
- E. Bypass Plenum: Within casing, with gasketed face-and-bypass dampers having operating rods extended outside casing.
- F. Supply and Exhaust Fans: Forward-curved, centrifugal fan with spring isolators and flexible duct connections.

1. Motor and Drive: Belt driven with adjustable sheaves, motor mounted on adjustable base.
 2. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 3. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 4. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.
 5. Spring isolators on each fan having 1-inch static deflection.
- G. Extended-Surface, Disposable Panel Filters: (Outdoor Air and Exhaust Air streams)
1. Comply with NFPA 90A.
 2. Provide minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
 3. Provide filter holding frames arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lift out from access plenum.
 4. Factory-fabricated, dry, extended-surface type.
 5. Thickness: 2 inches.
 6. Arrestance (ASHRAE 52.1): 90.
 7. Merv (ASHRAE 52.2): 8.
 8. Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid
- H. Indoor and Wiring: Fabricate units with space within housing for piping and electrical conduits. Wire motors and controls so only single point external connections are required during installation rip.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine casing insulation materials and filter media before air-to-air energy recovery equipment installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.
- C. Examine roughing-in for electrical services to verify actual locations of connections before installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install floor-mounted units on 4-inch- high concrete base.
- B. Install units with clearances for service and maintenance.
- C. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.

3.3 CONNECTIONS

- A. Comply with requirements for ductwork specified in Division 23 Section "Metal Ducts."
- B. Install piping adjacent to machine to allow service and maintenance.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Tests and Inspections:
 - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 2. Adjust seals and purge.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 4. Set initial temperature and humidity set points.
 - 5. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- C. Air-to-air energy recovery equipment will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.5 DEMONSTRATION

Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air-to-air energy recovery units.

SECTION 23 81 29
VRF HEAT PUMP SYSTEMS

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION MXZ PORTED

The heat pump air conditioning system shall be a Mitsubishi /Trane Single Unit System. The system shall consist of one ceiling recessed, indoor unit with a wired or wireless remote controller, connected to a compact horizontal discharge outdoor unit which shall be of an inverter driven heat pump design.

1.2 QUALITY ASSURANCE

- A. The system components shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.
- B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).
- C. The units shall be rated in accordance with Air-conditioning, Heating and Refrigeration Institute's (AHRI) Standard 240 and bear the AHRI Certification label.
- D. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001, which is a set of standards applying to product and manufacturing quality and environmental management and protection set by the International Standard Organization (ISO).
- E. A dry air holding charge shall be provided in the indoor section.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Unit shall be stored and carefully handled according to the manufacturer's recommendations.
- B. Unit shall be stored and carefully handled according to the manufacturer's recommendations.
- C. The wireless remote controller, for the wall mounted and floor standing indoor units, shall be shipped inside the carton, and packaged with the indoor unit and shall be able to withstand 105°F storage temperatures and 95% relative humidity without adverse effect.

1.4 WARRANTY

The units shall have a manufacturer's parts and defects warranty for a period five (5) years from date of installation. The compressor shall have an extended warranty of seven (7) years from date of installation.

If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty will not include labor.

Installing contractor shall meet manufacturer requirements to obtain extended manufacturer's limited parts and compressor warranty for a period of ten (10) years to the original owner from date of installation. This warranty shall not include labor.

Manufacturer shall have a minimum of thirty eight (38) years continuous experience in the U.S. market.

All manufacturer technical and service manuals must be readily available for download by any local contractor should emergency service be required

PART 2 - PRODUCTS

2.1 OUTDOOR UNITS

A. GENERAL

1. The outdoor unit shall be specifically designed to work with the 4-way ceiling recessed, unit type. The outdoor unit shall be completely factory assembled, piped, and wired. Each unit shall be run tested at the factory prior to shipment.
2. If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor. Contractor responsible for ensuring alternative brand compatibility in terms of availability, physical dimensions, weight, electrical requirements, etc.
3. Outdoor unit shall have a sound rating no higher than 58 dB(A). If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.
4. Refrigerant lines from the outdoor unit to the indoor units shall be insulated in accordance with the installation manual.
5. The outdoor unit shall meet performance requirements per schedule and be within piping limitations & acceptable ambient temperature ranges as described in respective manufacturers' published product catalogs. Non-published product capabilities or performance data are not acceptable.
6. The outdoor unit shall be capable of guaranteed operation in heating mode down to -13°F ambient temperatures and cooling mode up to 115°F without additional restrictions on line length & vertical separation beyond those published in respective product catalogs. Models with capacity data for required temperature range published as "for reference only" are not considered capable of guaranteed operation and are not acceptable. If an alternate manufacturer is selected, any additional material, cost, and labor to meet ambient operating range and performance shall be incurred by the contractor.
7. The outdoor unit shall be provided with a manufacturer supplied 20 gauge hot dipped galvanized snow/hail guard. The snow/hail guard protects the outdoor coil surfaces from hail damage and snow build-up in severe climates.
8. Four-legged outdoor unit mounting systems shall be provided by manufacturer. Stand shall be made from 7 gauge plate steel with thermally fused polyester powder coat finish that meets ASTM D3451-06 standards. Stands shall be provided with galvanized mounting hardware and meets all ASCE 7 overturning safety requirement.

B. UNIT CABINET

1. The casing shall be fabricated of galvanized steel, bonderized, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection. Assembly hardware shall be cadmium plated for weather resistance.
2. Cabinet color shall be Munsell 3Y 7.8/1.1.
3. Two (2) mild steel mounting feet, traverse mounted across the cabinet base pan, welded mount, providing four (4) slotted mounting holes shall be furnished. Assembly shall withstand lateral wind gust up to 155 MPH to meet applicable weather codes.

C. FAN

1. The unit shall be furnished with a direct drive, high performance propeller type fan.
2. The condenser fan motor shall be a variable speed, direct current (DC) motor and shall have permanently lubricated bearings.
3. Fan speed shall switch automatically according to the number of operating indoor units and the compressor operating frequency.
4. The fan motor shall be mounted with vibration isolation for quiet operation.
5. The fan shall be provided with a raised guard to prevent contact with moving parts.
6. The outdoor unit shall have horizontal discharge airflow.

D. REFRIGERANT AND REFRIGERANT PIPING

1. R454B refrigerant shall be required for systems.
2. Polyolester (POE) oil—widely available and used in conventional domestic systems—shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.
3. Refrigerant piping shall be phosphorus deoxidized copper (copper and copper alloy seamless pipes) of sufficient radial thickness as defined by the equipment manufacturer and installed in accordance with manufacturer recommendations.
4. All refrigerant piping must be insulated with closed cell, CFC-free foam insulation with flame-Spread Index of less than 25 and a smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102. R value of insulation must be at least 3.
5. Refrigerant piping limits shall be in accordance with manufacturer specifications.

E. COIL

1. The outdoor unit coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
2. The coil shall be protected with an integral guard.
3. Refrigerant flow from the outdoor unit to the indoor units shall be independently controlled by means of individual electronic linear expansion valves for each indoor unit. All refrigerant lines between outdoor and indoor units shall be of annealed, refrigeration grade copper tubing, ARC Type, meeting ASTM B280 requirements, individually insulated in twin-tube, flexible, closed-cell,
4. CFC-free (ozone depletion potential of zero), elastomeric material for the insulation of refrigerant pipes and tubes with thermal conductivity equal to or better than 0.27 BTU-inch/hour per Sq Ft / °F, a water vapor transmission equal to or better than 0.08 Perm-inch and superior fire ratings such that insulation will not contribute significantly to fire and up to 1" thick insulation shall have a Flame-Spread Index of less than 25 and a Smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102.
5. All refrigerant connections between outdoor and indoor units shall be flare type.

F. COMPRESSOR

1. The compressor shall be a high performance, hermetic, inverter driven, variable speed, dual rotary type manufactured by Mitsubishi Electric Corporation.
2. The compressor motor shall be direct current (DC) type equipped with a factory supplied and installed inverter drive package.
3. The compressor will be equipped with an internal thermal overload.
4. The outdoor unit shall be equipped with a suction side refrigerant accumulator.

5. There shall be no need for line size changes. Filters, sight glasses, and traps shall not be used, and no additional refrigerant oil shall be required.
6. The compressor shall be mounted to avoid the transmission of vibration.

G. BASEPAN HEATER

Each outdoor unit module shall be equipped with a basepan heater to protect the coil against ice build-up during prolonged winter operation. Basepan heater shall activate only if compressor is operating in heating mode at an outdoor ambient temperature of 36F or below.

H. OPERATING RANGE

Operating Range shall be in accord with the Table below:

Operating Range		Indoor Intake Air Temp	Outdoor Intake	Air Temp
Cooling	Maximum	95°F (35°C) DB, 71°F(21°C) WB	115°F (46°C)	DB
	Minimum	67°F (19°C) DB, 57°F(14°C) WB	14°F (-10°C)	DB
Heating	Maximum	80°F (27°C) DB, 67°F(19°C) WB	75°F (24°C)	DB, 65°F(18°C) WB
	Minimum	70°F (21°C) DB, 60°F(16°C) WB	6°F (-14°C) -12°F (-24°C)	DB, 5°F(-15°C) WB DB, -13°F(-25°C) WB*

I. ELECTRICAL

1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
2. The unit shall be capable of satisfactory operation within voltage limits of 198 volts to 253 volts.
3. The outdoor unit shall be controlled by the microprocessors located in the indoor unit and in the outdoor unit communicating system status, operation, and instructions digitally over A-Control – a system directing that the indoor unit be powered directly from the outdoor unit using a 3- wire, 14 gauge AWG connection plus ground.
4. The outdoor unit shall be equipped with Pulse Amplitude Modulation (PAM) compressor inverter drive control for maximum efficiency with minimum power consumption.

A. FAN

1. The indoor fan shall be statically and dynamically balanced to run on a single motor with permanently lubricated bearings.
2. An integral, motorized, multi-position, horizontal air sweep vane shall provide for uniform air distribution, up and down. Vane shall have 5 selectable positions plus AUTO (Controls position based upon mode, microprocessor shall automatically determine the vane angle to provide the optimum room temperature distribution) and SWING (Continuously moves up and down). In OFF mode the horizontal vane shall return to the closed position.
3. A motorized adjustable vertical guide vane shall be provided with the ability to change the airflow from side to side (left to right). Vane shall be positioned by a stepper motor driven by the indoor unit

control microprocessor. Vane shall have 5 selectable positions and SWING (Continuously moves left and right).

4. The indoor unit shall include an AUTO fan setting capable of maximizing energy efficiency by adjusting the fan speed based on the difference between controller set-point and space temperature. The indoor fan shall be capable of six (6) speed settings, Quiet, Low, Med, High, Super High and Auto (2 ton unit does not have Quiet setting).

B. FILTER

Return air shall be filtered by means of two (2) easily removable, washable Nano Platinum Filters, and Electrostatic Anti-Allergy Enzyme Filters.

C. COIL

1. The indoor unit coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with silver alloy.
4. The coils shall be pressure tested at the factory.
5. A sloped, corrosion resistant condensate pan with drain shall be provided under the coil.
6. A drain pan level switch (SS610E), designed to connect to the control board, shall be provided, if required, and installed in the condensate pan to prevent condensate from overflowing.

D. ELECTRICAL

1. The unit electrical power shall be 208-230 volts, 1-phase, 60 hertz.
2. The system shall be equipped with A-Control – a system directing that the indoor unit be powered directly from the outdoor unit using a 3-wire, 14 gauge AWG connections plus ground.
3. The indoor unit shall not have any supplemental electrical heat elements.

E. CONTROLS

1. The unit shall include an IR receiver for wireless remote control flexibility
2. The unit shall ship with a wireless handheld remote with the unit
3. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.

PART 3 – CONTROLS

3.1. INSTALLATION AND WORKMANSHIP

- A. The control system shall consist of a minimum of one microprocessor on each indoor unit and one in the outdoor unit, communicating via A-Control data over power transmission. The microprocessor located in the indoor unit shall have the capability of monitoring return air temperature and indoor coil temperature, receiving and processing commands from the wired or wireless controller, providing emergency operation and controlling the outdoor unit. The control signal between the indoor and outdoor unit shall be pulse signal 24 volts DC. Indoor units shall have the ability to control supplemental heat via connector CN24 and a 12 VDC output.
- B. For A-Control, a three (3) conductor 14 gauge AWG wire with ground shall provide power feed and bi-directional control transmission between the outdoor and indoor units. If code requires a disconnect

mounted near the indoor unit, a TAZ-MS303 3-Pole Disconnect shall be used – all three conductors must be interrupted.

- C. The system shall be capable of automatic restart when power is restored after power interruption. The system shall have self-diagnostics ability, including total hours of compressor run time. Diagnostics codes for indoor and outdoor units shall be displayed on the wired controller panel.
- D. A remote controller needs to be selected and ordered separately from the unit unless the indoor unit is a wall mounted (excludes PKA), floor mounted or one-way ceiling recessed unit.

3.2. REMOTE CONTROLLERS

A. Wireless, Wall Mounted Remote Controller Kit:

1. The Wireless, wall mounted remote controller kit (MHK2) shall consist of a wireless, wall mounted controller (MRCH2), a wireless receiver (MIFH2) and a cable (MRC2) to connect the receiver to connector CN105 on the indoor unit control board.
2. The controller shall be white in color with a blue LCD display and a backlight feature. The controller shall have a built-in temperature sensor and a battery holder, using two AA alkaline batteries. Temperature shall be displayed in either Fahrenheit (°F) or Celsius (°C), and temperature changes shall be by increments of 1°F (0.5°C).
3. The MHK2 uses Honeywell RedLINK™ technology, and the wireless receiver is specially designed for Mitsubishi units. Linking to the wireless network shall be done from the receiver and from the remote controller. There shall not be any interference with other wireless devices or neighboring RedLINK™ products. Communication shall be automatically restored after power resumes and after batteries are replaced.
4. The MHK2 and the Kumo Cloud Adapter shall be able to work together on the same indoor unit using a Wireless Interface 2 (PAC-USWHS002-WF- 2).

Wireless, Wall Mounted Remote Controller Kit (MHK2)	
Item	Description
Number of Units Controllable	1 unit
ON/OFF	Run and stop operation
Operation Mode	Switches between Cool/Drying/Auto/Fan/Heat.
Temperature Setting (Range and modes depend on connected unit model)	Controller general set point temperature range: Cool/Dry: 50°F-99°F Heat: 40°F-90°F Auto: 50°F-90°F
Fan Speed Setting (Range and modes depend on connected unit model)	Hi/Mid-2/Mid-1/Low/Auto

Air Flow Direction Setting (Air flow direction settings depend on the unit model)	Air flow direction angles 100%-80%-60%-40%, Swing.
Dual Setpoint Control	Separate heating and cooling set points. Adjustable dead band from 2°F to 8°F. Automatically adjusts set points to ensure dead band. System changeover with dual set points.
Scheduling	5-2 and 5-1-1 schedules Separate Heat/Cool schedules Allows operation in AUTO with Scheduling setbacks and dual setpoint Simple temperature setting can be done up to 4 times per day in the week. The time can be set by the 15-minute interval. Remote controller shall be programmable as either a residential controller, which will offer residential scheduling options only; or as a commercial controller, which will offer commercial scheduling options only.
Wireless, Wall Mounted Remote Controller Kit (MHK2)	
Item	Description
Optimal Start	Set occupied time and desired set temperature Remote controller learns when to start warm up or cool down so that space is at set temperature at start of occupied time
Operating Conditions Display	Setpoint and room temperature. Default sensing is at the remote controller. Installer setting to select at return air sensor. Automatically switches to return air sensor if communication to remote controller is lost
Additional Functions	Hold Function Temporary Schedule Override Reset to factory default
Error	When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed

Auto Lock Out Function	Setting/releasing of simplified locking for remote control settings can be performed. • Locking of all settings • Locking of ON/OFF setting • Locking of system setting (Heat, Cool, Off, Auto, etc.) • Locking of fan setting • Locking of temperature setting Locking of Clock/Day/Schedule

B. Wireless, Wall Mounted Remote Controller Kit:

1. On wall mount (excludes PKA), floor mount and one-way ceiling recessed units the Backlit Simple MA Remote Controller shall require a MAC- 334IF-E Interface for communication.
2. The Backlit Simple MA Remote Controller shall be capable of controlling up to 16 indoor units (defined as 1 group). When grouping M-Series units each unit requires a MAC-334IF-E Interface.
3. The Backlit Simple MA Remote Controller shall only be used in same group with another Backlit Simple MA Remote Controller, with up to two remote controllers per group.

Simple MA Remote Controller			
Item	Description	Operation	Display
ON/OFF	Run and stop operation for a single group	Each Group	Each Group
Operation Mode	Switches between Cool/Drying/Auto/Fan/Heat. Operation modes vary depending on the air conditioner unit.	Each Group	Each Group
Simple MA Remote Controller			
Item	Description	Operation	Display
Temperature Setting	Sets the temperature from 40°F – 95°F depending on operation mode and indoor unit.	Each Group	Each Group
Fan Speed Setting	Available fan speed settings depending on indoor unit.	Each Group	Each Group
Air Flow Direction Setting	Air flow direction settings vary depending on the indoor unit model.	Each Group	Each Group
Permit / Prohibit Local Operation	Individually prohibit operation of each local remote control function (Start/Stop, Change operation mode, Set temperature, Reset filter). *1: Centrally Controlled is displayed on the remote controller for prohibited functions.	N/A	Each Group *1
Display Indoor Unit Intake	Measures and displays the intake temperature of the indoor unit when the indoor unit is operating.	N/A	Each Group

Display Backlight	Pressing the button lights up a backlight. The light automatically turns off after a certain period of time. (The brightness settings can be selected from Bright, Dark, and Light off.)	N/A	Each Unit
Error	When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed	N/A	Each Unit
Test Run	Operates air conditioner units in test run mode. *2 The display for test run mode will be the same as for normal start/stop (does not display “test run”).	Each Group	Each Group *2
Ventilation Equipment	Up to 16 indoor units can be connected to an interlocked system that has one LOSSNAY unit.	Each Group	N/A
Set Temperature Range Limit	Set temperature range limit for cooling, heating, or auto mode.	Each Group	Each Group

C. WIRELESS MA REMOTE CONTROLLER:

1. The Wireless MA Remote Controller used in conjunction with the Wireless MA Remote Controller Receiver shall be capable of controlling up to 16 indoor units (defined as 1 group).
2. The Wireless MA Remote Controller and Receiver shall only be used in the same group with other Wireless MA or Simple MA Remote Controllers, with up to two remote controllers per group.

Wireless MA Remote Controller			
Item	Description	Operation	Display
ON/OFF	Run and stop operation for a single group	Each Group	Each Group
Operation Mode	Switches between Cool/Dry/Auto/Fan/Heat. Operation modes vary depending on the air conditioner unit.	Each Group	Each Group
Temperature Setting	Sets the temperature from 40°F – 87°F depending on operation mode and indoor unit.	Each Group	Each Group
Fan Speed Setting	Available fan speed settings depending on indoor unit.	Each Group	Each Group
Air Flow Direction Setting	Air flow direction settings vary depending on the indoor unit model.	Each Group	Each Group

Timer Operation	One ON/OFF setting can be set for one day.	Each Group	Each Group
Permit / Prohibit Local Operation	Individually prohibit operation of each local remote control function (ON/OFF, Change operation mode, Set temperature, Reset filter). *1. If operation is performed when the local remote controller inactivation command is received from the main system controller, a buzzer will ring and an LED will flash.	N/A	Each Group *1
Display Indoor Unit Intake Temp	Measures the intake temperature of the indoor unit when the indoor unit is operating.	N/A	N/A
Error	When an error is currently occurring on an air conditioner unit, the operation lamp on the signal receiving unit will flash.	N/A	Each Group
Test Run	Operates air conditioner units in test run mode.	Each Group	Each Group
Ventilation Equipment	Up to 16 indoor units can be connected to an interlocked system that has one LOSSNAY unit.	N/A	N/A

D. DELUXE WIRED MA REMOTE CONTROLLER:

1. On wall mount (excludes PKA), floor mount and one-way ceiling recessed units the Deluxe Wired MA Remote Controller shall require a MAC-334IF- E Interface for communication.
2. The Deluxe Wired MA Remote Controller shall be capable of controlling up to 16 indoor units (defined as 1 group). When grouping M-Series units each unit requires a MAC-334IF-E Interface.
3. The Deluxe Wired MA Remote Controller shall only be used in same group with another Deluxe Wired MA Remote Controller, with up to two remote controllers per group.

Wired MA Remote Controller			
Item	Description	Operation	Display
ON/OFF	Run and stop operation for a single group	Each Group	Each Group
Operation Mode	Switches between Cool/Drying/Auto/Fan/Heat. Operation modes vary depending on the air conditioner unit.	Each Group	Each Group
Temperature Setting	Sets the temperature from 40°F – 87°F depending on operation mode and indoor unit.	Each Group	Each Group
Fan Speed Setting	Available fan speed settings depending on indoor unit.	Each Group	Each Group
Air Flow Direction Setting	Air flow direction settings vary depending on the indoor unit model.	Each Group	Each Group
Permit / Prohibit Local Operation	Individually prohibit operation of each local remote control function (Start/Stop, Change operation mode, Set temperature, Vane, Reset filter). *1: Centrally Controlled is displayed on the remote controller for prohibited functions.	N/A	Each Group *1
Display Indoor Unit Intake Temp	Measures and displays the intake temperature of the indoor unit when the indoor unit is operating.	N/A	Each Group
Display Backlight	Pressing a button lights up a backlight. The light automatically turns off after a certain period of time. (The brightness settings can be selected from Bright, Dark, and Light off.)	N/A	Each Unit
Error	When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed	N/A	Each Unit
Test Run	Operates air conditioner units in test run mode.	Each Group	Each Group *2
	*2 The display for test run mode will be the same as for normal start/stop (does not display “test run”).		

Wired MA Remote Controller			
Item	Description	Operation	Display
Ventilation Equipment	Up to 16 indoor units can be connected to an interlocked system that has one LOSSNAY unit.	Each Group	N/A
Set Temperature Range Limit	Set temperature range limit for cooling, heating, or auto mode.	Each Group	Each Group
Schedule	Set up to 8 operations per day, 7 days per week. Operations include time on/off, mode and room temperature set point.	Each Group	Each Group

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PART 4 – EXECUTION

4.1 INSTALLATION

- A. Coordinate with other trades for installation of heat pump equipment and associated electrical wiring, control wiring, refrigerant piping, and condensate piping.
- B. Coordinate with roofing systems contractor for roofing requirements at heat pump condensing unit refrigerant and wiring penetrations, and condensing unit support locations.
- C. Follow Manufacturer's installation instructions unless more stringent requirements are noted elsewhere in these specifications or on the drawing.

SECTION 23 82 39
UNIT HEATERS

PART 1 - GENERAL

1.1 **SUMMARY**

Section includes: cabinet unit heaters.

1.2 **REFERENCES**

- A. ARI 410 (Air-Conditioning and Refrigeration Institute) - Forced-Circulation Air-Cooling and Air-Heating Coils.
- B. UL 1096 (ANSI/Underwriters Laboratories, Inc.) - Electric Central Air Heating Equipment.
- C. SMACNA (Sheet Metal Air Conditioning Contractors' National Association) - HVAC Duct Construction Standards, Metal and Flexible.

1.3 **SUBMITTALS**

- A. See Section 013300 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations. Indicate schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers
- C. Product Data: Submit coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions. Submit mechanical and electrical service locations, capacities and requirements.
- D. Manufacturer's Installation Instructions: Submit.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.4 **CLOSEOUT SUBMITTALS**

- A. Section 017700 - Execution Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access to valves.
- C. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

1.5 **DELIVERY, STORAGE, AND HANDLING**

- A. Follow Product Requirements: Product storage and handling requirements.

- B. Accept units onsite in factory packing. Inspect for damage. Store under roof.
- C. Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors. Protect coils from entry of dirt and debris with pipe caps or plugs.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.7 WARRANTY

- A. Follow Execution Requirements: Product warranties and product bonds.

1.8 EXTRA MATERIALS

- A. Follow Execution Requirements: Spare parts and maintenance products.

PART 2 - PRODUCTS

2.1 UNIT HEATERS

- A. Coils: Seamless copper tubing, silver brazed to steel headers, and with evenly spaced aluminum fins mechanically bonded to tubing.
- B. Casing: 0.0478-inch thick steel with threaded pipe connections for hanger rods.
- C. Finish: Factory applied baked enamel.
- D. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard; horizontal models with permanently lubricated sleeve bearings; vertical models with grease-lubricated ball bearings.
- E. Air Outlet: Adjustable pattern diffuser on projection models and two-way louvers on horizontal throw models.
- F. Motor: Permanently lubricated sleeve bearings on horizontal models, grease lubricated ball bearings on vertical models.
- G. Control: Local disconnect switch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify concealed blocking and supports are in place and connections are correctly located.

3.2 INSTALLATION

- A. Install coils in ducts and casings in accordance with SMACNA HVAC Duct Construction Standards, Metal and Flexible.
- B. Protect coils to prevent damage to fins and flanges. Comb out bent fins.
- C. Install coils level.
- D. Make connections to coils with unions and flanges.
- E. Unit Heaters: Hang from building structure, with pipe hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated.
- F. Fan-Coil Units: Install as indicated. Coordinate to assure correct recess size for recessed units.

3.3 CLEANING

- A. Follow Execution Requirements: Final cleaning.
- B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.
- C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.
- D. Install new filters.

SECTION 23 83 33.1
ELECTRIC RADIANT HEATERS-COMMERCIAL

PART 1 - GENERAL

1.1 SCOPE

- A. The Contractor shall furnish and install all electric heaters, and their controls as shown on the plans.
- B. The Contractor will submit shop drawings of all items furnished as described in this section.

PART 2 - PRODUCTS

2.1 BASEBOARD HEAT

- A. The electric baseboard heaters shall be 208/230 volt, 250 watts per foot, commercial type, UL listed, as scheduled on the plans, Stelpro Model ABA or better.
 - 1. Finish shall be Epoxy-Polyester Powdercoat.
 - 2. 22-gauge steel cabinet
 - 3. 11-gauge extruded aluminum with molded and curved end-caps.
 - 4. Thermal protection with automatic reset.
 - 5. Full length wireway.
- B. Element – single tubular, stainless steel sheathed element with boxed aluminum fins.
- C. Control – electronic wall thermostat, unless otherwise noted or scheduled.
 - 1. Built-in mechanical single pole or double pole thermostat.
 - 2. Low-voltage relay kit with transformer.
 - 3. Disconnect switch.
- D. Warranty – Five years. Lifetime on heating element.

2.2 ELECTRIC UNIT HEATER

- A. The electric unit heater shall be 208/230 volt, commercial type, as scheduled on the plans, Stelpro Model Oxford ASHU or better.
 - 1. Finish shall be Epoxy-Polyester Powdercoat.
 - 2. 18-gauge steel cabinet
 - 3. Adjustable louvers and protective screens
 - 4. Thermal protection with automatic reset
- B. Nichrome Element
- C. Control – electronic wall thermostat, unless otherwise noted or scheduled.

1. Built-in mechanical single pole or double pole thermostat.
2. Low-voltage relay kit with transformer.
3. Disconnect switch.

D. Warranty – 3 Years

PART 3 - EXECUTION

3.1 HEATER INSTALLATION

- A. Surface mount electric heating units per manufacturer's instructions.
- B. Install wall mounted thermostats in outlet box 60" above finished floor, 48" in ADA spaces.
- C. Do not install baseboard units under wall receptacles.
- D. Coordinate controls with VRF controls.

SECTION 26 05 00
ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 **SCOPE**

- A. The work covered by this section includes the furnishing of all labor, material, equipment, and incidentals and the performing of all operations in connection with "electrical work" as indicated on the drawings and/or herein specified and including all incidental items to affect a finished and complete job even though such items are not shown or particularly mentioned herein. All work shall be subject to terms and conditions of the contract and applicable portions of the General Conditions and Special Conditions of the Specifications.
- B. All work and material shall be in strict accordance with those plans and specifications, even though they may be in excess of minimum requirements of applicable codes and regulations. The electrical work will include service entrances, metering, telephone, and power panels, lighting, cable TV systems, communications, etc.
- C. The work under this Division is divided into sections for convenience only, and it is not the intent to define or establish the limits of the work or responsibility of the Contractor to provide a complete workable job.
- D. The Contractor shall assume all responsibility to have thoroughly examined the drawings and design criteria including all addenda, facilities and conditions, taken all field measurements of related and connected work, and to have determined the entire scope of the work required for a finished and completed project, in accordance with the drawings and design criteria and as approved by the Engineer. Any questions over conflicting information shown on the drawings and specifications shall be referred to the Engineer for clarification. Any item or object omitted but clearly needed to make a system operate shall be furnished complete.

1.2 **COLOR CODING**

- A. All wiring except bare equipment grounding conductors shall be color-coded.
- B. The power wiring shall be color-coded with tape, red, blue and black, for insulated conductors. The neutral shall be white or gray. Comply with National Electrical Code (NEC), Article 210. Use green or green with yellow stripe for equipment ground.

1.3 **INCIDENTAL WORK BY OTHERS**

- A. Excavation, trenching, backfill, outdoor pole bases, cutting and patching by General Contractor.
- B. Cost of Electric power during construction to be paid by General Contractor
- C. Finish painting by Painting Contractor

1.4 **CODES, PERMITS, INSPECTIONS**

- A. The installation shall comply with all laws applying to the electrical installation in effect at the site with regulations of any other governmental body or agency having jurisdiction, and with the regulations of the NEC where such regulations do not conflict with those laws.
- B. The communications conduits, panelboards and outlets shall be installed to conform with the requirements of the Owner and Communications Company. The Contractor shall verify work (as shown on plans and specified) with the Engineer before installation.

- C. The Contractor shall obtain and pay for all permits required by the ordinances at the site. After completion of the work, the Contractor shall furnish to the Engineer, for the Owner, a certificate of final inspection and approval from the authority having jurisdiction.

1.5 EXTRA WORK ORDERS - CREDITS

- A. No extra work will be paid unless authorized by the Engineer in writing. Where extra work is required, the Contractor shall provide an itemized account for the work or materials involved and shall take into consideration any credits due or work omitted for any reasons. Estimates shall clearly list such omitted work with proper credit given for same.
- B. Amounts of credits for work omitted and/or substitutions shall be approved by the Engineer and/or Owners. All credit submittals and approvals shall be in writing.

1.6 STANDARDS

- A. All materials, equipment and installation shall comply with the following:
 - 1. The NEC, latest approved edition.
 - 2. Any and all Federal, State and/or local codes, applicable ordinances, and regulations.
 - 3. Latest approved standards of IEEE, ANSI, NEMA, and NFPA.
 - 4. Local utility and telephone company regulations.
 - 5. All equipment shall be new and U.L. listed where listing is available.

1.7 SUBSTITUTIONS

- A. Where equipment and materials are indicated "or equivalent" substitution of items equal in quality, performance, rating, and appearance will be permitted upon specific review in writing by the Engineers before installation. Specific criteria for substitution of certain equipment are defined elsewhere.
- B. In all cases, the right is reserved to require adequate proof of the equality and acceptability of the substitute before permitting its use. The Contractor shall assume the cost and the entire responsibility for any changes in any phase of building construction, as shown on the contract drawings or required by the specifications, which may be occasioned by review of materials and equipment other than that specified.

1.8 GUARANTEE - WARRANTY

- A. This Contractor shall and hereby does warrant and the General Contractor shall and hereby does guarantee that all work executed under this section will be free from defects of materials and workmanship for a period of one (1) year from the date of the final certificate.
- B. This Contractor shall further warrant that all materials furnished are new and that the work executed is in accordance with all applicable laws, regulations, etc.

1.9 MATERIALS

Material specifications are included hereinafter under each specific section.

1.10 EQUIPMENT

Equipment specifications are included hereinafter under each specific section.

1.11 TEMPORARY POWER

- A. Temporary power for all trades will be provided by the Contractor, and the cost of electrical power shall be borne by the General Contractor.
- B. The Contractor shall furnish at least a 200-amp single-phase service, 115/230 volts with a 200-watt lamp connection for each 1000 square feet. (No lamp shall be furnished by the Contractor.)

Furnish grounded duplex outlets as required. Outlets shall be located so that 50' extension (fbo) will reach any point. Power to outlets shall be limited to 1/2 HP motors 115/240 volts. If additional power is required it shall be furnished by others.

1.12 SITE VISITATION

Due to the nature of the work, certain details of the site may not be shown or specified. The Contractor should visit the site and failure to do this shall not relieve the responsibility of the Contractor, as no additional payments or extras will be allowed for conditions encountered in the execution of the work in accordance with the intent of the plans and specifications.

1.13 WORK PROGRESS

- A. The Contractor shall coordinate his work with the progress of the building and other trades such that he shall complete his work as soon as conditions permit. Any overtime or additional costs incurred by a lack of improper coordination with other trades shall be borne by the Contractor without any additional costs to the Owner.
- B. Waste material shall be removed promptly from the premises. All material and equipment stored on the premises shall be kept in a neat and orderly fashion and protected from exposure and the weather.

1.14 TESTS

- A. After the interior wiring system installation is completed and at such time as the Engineer or Owner may direct, the Contractor shall conduct an operating test for approval. The equipment shall be demonstrated to operate in accordance with the requirements of this specification. The tests shall be performed in the presence of the Owner, Engineer, or their authorized representative. The Contractor shall furnish all instruments and personnel required for the tests, and the Owner will furnish the necessary electric power.
- B. Special tests required for certain systems may be detailed elsewhere in this specification.

1.15 AS BUILT DRAWINGS

The Contractor shall submit a neatly marked up set of Electrical Drawings to the Engineer for record of final installation as actually installed. This copy will be returned to the Owner after records are made.

1.16 EXCESS COSTS

The contractor **shall carry in his bid any "excess cost"** charged by the local utility company for items such as poles, wire, conduit, transformers, meter connections, etc. to bring the required electrical service to the building.

1.17 UNUSED ELECTRICAL WORK

Remove all unused electrical work that will be exposed on completion of the work. All existing unused electrical equipment shall become the property of the contractor and be removed from the premises.

SECTION 26 05 19
POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SCOPE

- A. All conductor material, insulation and fittings shall meet National Electrical Code (NEC) requirements. All conductors and fittings shall be U.L. listed. All conductors shall be listed for 600 volt A.C. All conductors shall be sized to meet the NEC ampacity and voltage drop requirements.
- B. Minimum size power wiring shall be #12 AWG. Minimum size control wiring shall be #16 AWG. Branch circuit conductor #8 and larger must be stranded.
- C. Branch wiring over 90 feet long must not be smaller than #10 AWG at 120 volts and over 150 feet at 208 volts.

PART 2 - PRODUCTS

2.1 MATERIAL

- A. Conductors #12, #10 and #8 may be either TW or THW. Larger sizes shall be THW. All wire #8 and larger must be stranded.
- B. Ground wire for use above ground shall be bare annealed copper or shall be insulated green or green with yellow stripes.
- C. Lugs for power conductor termination in switchgear, panelboards, etc., shall be compression type. Lugs shall be U.L. listed for cu/al.
- D. Connectors for #6 AWG and larger shall be compression type, U.L. listed for cu/al.
- E. Splices of wire sizes up through #8 may be wire nuts similar to U.L. listed Wing Nuts, Buchanan B caps or equivalent.
- F. Direct burial wire (if shown on plans) shall be Type U.F. copper. GE #51-58-51 or 58050/2 Southern Triangle or equivalent.
- G. Electrical tape shall be Scotch #88, 3M or equivalent.
- H. Conductors #2 AWG and larger may be aluminum providing the following items are adhered to:
 - 1. The ampere capacity, voltage drop and conduit fill is in accordance with the NEC and equal to copper specified on plans.
 - 2. Prior to making any connection the aluminum wire is to be brushed and an oxide inhibitor applied.
 - 3. Lugs and connectors are to be rated cu/al compression type.
 - 4. Termination of aluminum conductors at heat producing equipment such as motors or heaters is not acceptable.
 - 5. Grounding jumpers shall be copper and equipment ground wires shall be copper.
 - 6. The Electrical Contractor shall submit a list to the Engineer of feeder conductors indicating size, insulation and circuit for which substitutions are to be made.

7. Furnish U.L. listed aluminum to copper connectors MacAdept, 3M, or equivalent for aluminum termination of feeders at panels.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Splices for #6 and larger shall be by compression connectors.
- B. Follow the NEC Rules when homeruns are combined in a single conduit.
- C. Tape all bare surfaces of conductors with a minimum of 2 half lapped layers of electrical tape.
- D. Torque all electrical connections at panels per manufacturer's recommendations.
- E. Sleeve all direct burial cable in galvanized rigid steel or Schedule 40 PVC under paving and through masonry walls and footings.

SECTION 26 05 22
ELECTRIC SERVICE

PART 1 - GENERAL

1.1 **SCOPE**

- A. The electrical services will be 120/240 volt, single phase, 3 wire grounded at the building. The secondary shall be run underground to the building.
- B. All work shall comply with the National Electrical Code (NEC) and local Utility Company regulations and requirements.
- C. The General Contractor shall provide trenching and backfill.

PART 2 - PRODUCTS

2.1 **MATERIALS**

- A. Conduit shall be galvanized rigid steel and Schedule 40 PVC per 26 05 33.
- B. The meter (s) will be by the local Utility Company.
- C. Meter trim and Cabinet will be by the Electrical Contractor. Meter trim shall be as shown on the plans.
- D. Ground rods per Section 26 05 26.

PART 3 - EXECUTION

3.1 **INSTALLATION**

- A. The Electrical Contractor shall meet all the requirements of the local Utility Company and determine the extent of the utilities work.
- B. The Electrical Contractor shall install the meter trim.

SECTION 26 05 26
GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SCOPE

- A. The grounded conductor and equipment grounding conductors shall be connected from the service entrance equipment to the building ground electrode by the grounding electrode conductor in accordance to National Electrical Code (NEC) regulations, Article 250, and Utility requirements.
- B. Metal conduit shall be grounded in accordance to NEC requirements; but in addition to this, equipment-grounding conductors shall be furnished and installed and sized per plans.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Grounding electrode and equipment ground conductors shall be copper and sized per plans.
- B. Ground rods shall be copper clad steel, 3/4" dia. 10' long.

2.2 CONDUCTORS

- A. Insulated Conductors shall be copper wire or cable insulated 600 V unless otherwise required.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Bonding Cable: 28kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 - 4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferules; 1-5/8 inches wide and 1/16 inch thick.
- C. Grounding Bus shall be predrilled rectangular bars of annealed copper, 1/4 by 4 inches in cross section, with 9/32 inch holes spaced 1-1/8 inches apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and impulse tested at 5000 V.

2.3 CONNECTORS

- A. Connectors shall be listed and labeled by an authorized testing lab.
- B. Bolted Connectors for Conductors and pipes shall be copper or copper alloy pressure type with at least two bolts properly sized.
- C. Welded Connectors shall be with exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-bar Connectors shall be mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.4 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; ¾ dia, 10' long.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All grounding shall be in strict compliance with the NEC and these specifications.
- B. All equipment grounding conductors shall be bare copper or insulated copper with green jacket or green with yellow stripe or green tape as covered by the code.
- C. The bonding/grounding jumpers shall be sized by NEC Table 250.66. All grounding and bonding in the building must comply with the latest issue of the NEC.
- D. All metallic conduit used with power wiring shall be bonded to provide an effective ground. Use PVC conduit for service grounding conductors.
- E. Install ground rods as indicated with approved connectors.

3.2 APPLICATIONS

- A. Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Install bare copper conductor, No 2/0 AWG minimum for underground conductors.
 - 1. Bury at least 24 inches below grade.
 - 2. Bury duct bank grounding conductor 12 inches above duct bank when indicated as part of duct-bank installation.
- C. Isolated Grounding Conductors shall have green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
 - 1. Install bus on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
 - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down to specified height above floor; connect to horizontal bus.
- D. Conductor Terminations and Connections
 - 1. Pipe and Equipment Grounding Conductor Terminations shall be bolted connectors.
 - 2. Underground Connections shall be welded connectors except at test walls and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells shall be bolted connectors.
 - 4. Connections to Structural Steel shall be Welded connectors.

3.3 GROUNDING OVERHEAD LINES

- A. Comply with grounding requirements.
- B. Drive ground rods until tops are 12 inches below finished grade in undisturbed earth.

- C. Ground-Rod Connections: Install bolted connectors for underground connections and connections to rods.
- D. Secondary Neutral and Transformer Enclosure: Interconnect and connect to grounding conductor.

3.4 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- C. In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A for signal and communication equipment.
 - 1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in race way from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 - 2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a ¼-by-4-by-12-inch grounding bus.
 - 3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- D. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.5 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated.
 - 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Install Bonding Straps and Jumpers in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

D. Grounding and Bonding for Piping:

1. Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 2. Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- E. Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.
- F. Install a driven ground rod at base of each building corner column and at intermediate exterior columns at distances not more than 60 feet apart.
- G. All grounding shall be in strict compliance with the NEC and these specifications.
- H. All equipment grounding conductors shall be bare copper or insulated copper with green jacket or green with yellow stripe or green tape as covered by the code.
- I. The bonding jumpers shall be sized by NEC Table 250-95. All grounding and bonding in the building must comply with the latest issue of the NEC.
- J. All metallic conduit used with power wiring shall be bonded to provide an effective ground. Use PVC conduit for service grounding conductors.
- K. Install ground rods as indicated with approved connectors.

3.6 FIELD QUALITY CONTROL

- A. Perform Tests and Inspections.
1. Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Report Measured ground resistances that exceed the following values:
1. Power and Lighting Equipment of System with Capacity of 500 kVA and Less: 10 ohms.
- C. If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

SECTION 26 05 28
SUPPORTING DEVICES

PART 1 - GENERAL

1.1 SCOPE

- A. All inserts and anchors and hardware necessary for the support of electrical equipment shall be furnished under this section of the specifications.
- B. Apparatus shall be mounted to walls, columns, or machine frames (with 1/4" separation from same) and all necessary spacers, brackets, structural pieces, inserts, anchors and bolts necessary for this purpose shall be provided.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Wooden plugs inserted in masonry or concrete shall not be used as a base to fasten conduit supports. Conduit shall be supported on approved types of galvanized wall brackets, ceiling trapeze, strap hangers, or pipe straps, secured by means of toggle bolts, on hollow masonry units or expansion bolts in concrete or brick, machine screws on metal surfaces and wood construction.
- B. Where indicated, 3/4" plywood panels shall be wall mounted to support electrical and telephone equipment. Plywood shall be fire-rated and painted black.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Conduit systems shall be installed in accordance with the applicable provisions of the National Electrical Code (NEC).
- B. Conduit shall be installed in such manner as to insure against trouble from the collection of trapped condensation, and all runs of conduit shall be arranged so as to be devoid of traps wherever possible. The Contractor shall exercise the necessary precautions to prevent the lodgment of dirt, plaster or trash in conduit, fittings and boxes during the course of installation. A run of conduit which has become clogged shall be entirely freed of this accumulation, or shall be replaced.
- C. Conduit shall be securely fastened to all cast or sheet metal equipment, junction, or pull boxes with galvanized locknuts and bushings care being observed to see that the full number of threads project through which the locknut shall be made up sufficiently tight to draw the bushing into firm electrical contact with the box.
- D. Plywood panels shall be attached with hardware sized to support the weight of the equipment and the panels shall be painted gray with two coats of paint.
- E. Install exposed surface mounted devices or equipment less than 8' AFF with Ramset anchors or equivalent to masonry walls, size 1/4" x 1" or larger as required.

SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 SCOPE

Provide all hangers and supports for electrical equipment and systems as required.

PART 2 –PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support System shall comply with MFMA-4, factory-fabricated components for field assembly EQUAL TO Unistrut, Tyco International, Ltd.
 - 1. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 2. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
- B. Raceway and Cable Supports shall be as described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices shall be steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints shall be ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners shall be threaded-steel stud, for use in hardened Portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used equal to Hilti, Inc.
 - 2. Mechanical-Expansion Anchors shall be insert-wedge-type, zinc-coated steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used equal to Hilti, Inc.
 - 3. Concrete Inserts shall be steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 - 4. Clamps for Attachment to Steel Structural Elements shall meet MSS SP-58, type suitable for attached structural element.
 - 5. Through Bolts shall be structural type, hex head, and high strength. Comply with ASTM A 325.
 - 6. Toggle Bolts shall be all-steel springhead type.
 - 7. Hanger Rods shall be threaded steel.

PART 3 – EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Space supports for tubing or conduit as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits for multiple raceways or cables.
 - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements unless otherwise specified.
- B. Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- C. Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 - 5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
 - 6. To Light Steel: Sheet metal screws.
 - 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

A. Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint.

SECTION 26 05 33
RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 **SUMMARY**

This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring. The raceway and fittings shall include the conduit, wireway, and flexible metal conduit systems and their associated fittings as shown on the plans and in the specifications. The material herein described shall be approved for the service and shall be Underwriters Laboratories listed at the time of installation in every case where such a standard has been established.

1.2 **DEFINITIONS**

- A. EMT: Electrical metallic tubing.
- B. EPDM: Ethylene-propylene-diene terpolymer rubber.
- C. FMC: Flexible metal conduit.
- D. LFMC: Liquidtight flexible metal conduit.
- E. NBR: Acrylonitrile-butadiene rubber.
- F. RNC: Rigid nonmetallic conduit.

PART 2 - PRODUCTS

2.1 **METAL CONDUIT AND TUBING**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Allied Tube & Conduit; a Tyco International Ltd. Co.
 - 3. Electri-Flex Co.
 - 4. Maverick Tube Corporation.
 - 5. Wheatland Tube Company.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. EMT: ANSI C80.3.
- D. FMC: Zinc-coated steel.
- E. LFMC: Flexible steel conduit with PVC jacket.
- F. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
 - 1. Fittings for EMT: Steel, compression type.

2.2 NONMETALLIC CONDUIT AND TUBING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Arnco Corporation.
 - 3. CertainTeed Corp.; Pipe & Plastics Group.
 - 4. Electri-Flex Co.
 - 5. Thomas & Betts Corporation.
- B. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise specified.
- C. LFNC: UL 1660.
- D. Fittings for RNC: NEMA TC 3; match to conduit or tubing type and material.
- E. Fittings for LFNC: UL 514B.

2.3 METAL WIREWAYS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper B-Line, Inc.
 - 2. Square D; Schneider Electric.
- B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Screw-cover type.
- E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Architect.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Thomas & Betts Corporation.
 - b. Walker Systems, Inc.; Wiremold Company.
 - c. Wiremold Company; Electrical Sales Division.

2.5 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper Industries, Inc.

2. Hubbell Incorporated.
 3. Thomas & Betts Corporation.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.
- D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- E. Metal Floor Boxes: Sheet metal, fully adjustable, rectangular.
- F. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- G. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 2. Nonmetallic Enclosures: Plastic.
- H. Cabinets:
1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 2. Hinged door in front cover with flush latch and concealed hinge.
 3. Key latch to match panelboards.
 4. Metal barriers to separate wiring of different systems and voltage.
 5. Accessory feet where required for freestanding equipment.

2.6 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. Description: Comply with SCTE 77.
1. Color of Frame and Cover: Gray.
 2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
 3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
 4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
 5. Cover Legend: Molded lettering, as indicated for each service.
 6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
 7. Handholes 12 inches wide by 24 inches long and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.
- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armorcast Products Company.
 - b. Carson Industries LLC.
 - c. CDR Systems Corporation.

PART 3 – EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
1. Exposed Conduit: Rigid steel conduit.
 2. Concealed Conduit, Aboveground: Rigid steel conduit.
 3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
 4. Connection to Vibrating Equipment including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment: LFMC.
 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Comply with the following indoor applications, unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: EMT.
 2. Exposed, Not Subject to Severe Physical Damage: EMT.
 3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit.
 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 5. Connection to Vibrating Equipment including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment: FMC, except use LFMC in damp or wet locations.
 6. Damp or Wet Locations: Rigid steel conduit.
 7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, nonmetallic in damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements unless otherwise indicated.
- B. Keep raceways at least 12" away from parallel runs of flues and steam or hot-water pipes, 8" if crossing, 2" if insulated. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- E. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- F. Raceways Embedded in Slabs:
1. Run conduit larger than 1", parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 3. Change from NMC to rigid steel conduit before rising above the floor.
- G. Raceway Terminations at Locations Subject to Moisture or Vibration shall include the use of insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

- H. Install pull wires in all raceways. Leave at least 24" of slack at each end of pull wire.
- I. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.
- J. Set metal floor boxes level and flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom for pipe less than 6 inches in nominal diameter.
2. Install backfill. This work shall be the responsibility of the Division 31 contractor.
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
5. Bury warning tape approximately 12" below the finished grade (2" below slab).

SECTION 26 05 41
UNDERGROUND ELECTRICAL CONSTRUCTION

PART 1 – GENERAL

1.1 DESCRIPTION

- A. This section specifies the furnishing, installation, and connection of underground ducts and raceways, and precast structures and pullboxes to form a complete underground electrical raceway system.
- B. The terms “duct” and “conduit” are used interchangeably in this section.

1.2 RELATED WORK

- A. Trenching, backfill, and compaction.

1.3 QUALITY ASSURANCE

- A. Coordinate layout and installation of ducts, structures, and pullboxes with final arrangement of other utilities, site grading, and surface features.

PART 2 - PRODUCTS

2.1 PRE-CAST CONCRETE STRUCTURES AND HARDWARE

- A. Structure: Factory-fabricated, reinforced concrete, monolithically poured walls and bottom. Frame and cover shall form top of manhole.
- B. Ground Rod Sleeve: Provide a 3 inches PVC sleeve in manhole floors so that a driven ground rod may be installed.
- C. Sump: Provide 12 inches x 12 inches covered sump frame and grated cover.

2.2 PULLBOXES

- A. General: Size as indicated on the drawings. Provide pullboxes with weatherproof, non-skid covers with recessed hook eyes, secured with corrosion- and tamper-resistant hardware. Cover material shall be identical to pullbox material. Covers shall have molded lettering, ELECTRIC or SIGNAL as applicable. Provide pulling irons, 0.875 inch diameter galvanized steel bar with exposed triangular-shaped opening.
- B. Concrete Pull boxes: Shall be monolithically poured reinforced concrete.

2.3 DUCTS

- A. Number and sizes shall be as shown on the drawings.
- B. Ducts (concrete-encased):
 - 1. Plastic Duct:
 - a. UL 651 and 651A Schedule 40 PVC conduit.
 - b. Duct shall be suitable for use with 90° C (194° F) rated conductors.
 - 2. Conduit Spacers: Prefabricated plastic.

C. Ducts (direct-burial):

1. Plastic duct:
 - a. Schedule 40 PVC or HDPE conduit.
 - b. Duct shall be suitable for use with 167° F rated conductors.
2. Rigid metal conduit: Galvanized rigid metal, half-lap wrapped with 10-mil PVC tape.

2.4 GROUNDING

- A. Provide grounding and bonding for all electrical systems.

2.5 WARNING TAPE

- A. 4-mil polyethylene 3 inches wide detectable tape, red with black letters, imprinted with "CAUTION - BURIED ELECTRIC CABLE BELOW" or similar.

2.6 PULL ROPE FOR SPARE DUCTS

- A. Plastic with 200 lb minimum tensile strength.

PART 3 - EXECUTION

3.1 STRUCTURE AND PULLBOX INSTALLATION

- A. Assembly and installation shall be per the requirements of the manufacturer.
1. Install structures and pullboxes level and plumb.
 2. Units shall be installed on a 12 inches thick level bed of 90% compacted granular fill, well-graded from the 1-inch sieve to the No. 4 sieve. Granular fill shall be compacted with a minimum of four passes with a plate compactor.
- B. Access: Ensure the top of frames and covers are flush with finished grade.
- B. Grounding in Structures:
1. Ground Rods in Structures: Drive a ground rod into the earth, through the floor sleeve, after the manhole is set in place. Fill the sleeve with sealant to make a watertight seal. Rods shall protrude approximately 4 inches above the manhole floor.
 2. Install a No. 3/0 AWG bare copper ring grounding conductor around the inside perimeter of the manhole and anchor to the walls with metallic cable clips.
 3. Connect the ring grounding conductor to the ground rod by an exothermic welding process.
 4. Bond the ring grounding conductor to the duct bank equipment grounding conductors, the exposed non-current carrying metal parts of racks, sump covers, and like items in the structures with a minimum No. 6 AWG bare copper jumper using an exothermic welding process.

3.2 TRENCHING

- A. Before performing trenching work at existing facilities, contact Digsafe to reveal all known existing underground ducts, conduits, cables, and other utility systems.
- B. Work with extreme care near existing ducts, conduits, and other utilities to avoid damaging them.
- C. Cut the trenches neatly and uniformly.

- D. Individual conduits to be installed under existing paved areas and roads that cannot be disturbed shall be jacked into place using rigid metal conduit, or bored using plastic utilities duct or PVC conduit, as approved by the Engineer.

3.3 DUCT INSTALLATION

A. General Requirements:

1. Ducts shall be in accordance with the NEC, as shown on the drawings, and as specified.
2. Join and terminate ducts with fittings recommended by the manufacturer.
3. Slope ducts to drain towards structures and pullboxes, and away from building and equipment entrances. Pitch not less than 4 inch in 100 feet.
4. Underground conduit stub-ups and sweeps to equipment inside of buildings shall be galvanized rigid metal conduit half-lap wrapped with PVC tape, and shall extend a minimum of 5 feet outside the building foundation. Tops of conduits below building slab shall be minimum 24 inches below bottom of slab.
5. Stub-ups and sweeps to equipment mounted on outdoor concrete slabs shall be galvanized rigid metal conduit half-lap wrapped with PVC tape, and shall extend a minimum of 5 feet away from the edge of slab.
6. Install insulated grounding bushings on the conduit terminations.
7. Radius for sweeps shall be sufficient to accomplish pulls without damage. Minimum radius shall be six times conduit diameter.
8. All multiple conduit runs shall have conduit spacers. Spacers shall securely support and maintain uniform spacing of the duct assembly a minimum of 3 inches above the bottom of the trench during the concrete pour. Spacer spacing shall not exceed 5 feet. Secure spacers to ducts and earth to prevent floating during concrete pour. Provide nonferrous tie wires to prevent displacement of the ducts during concrete pour. Tie wires shall not act as substitute for spacers.
9. Duct lines shall be installed no less than 12 inches from other utility systems, such as water, sewer, and chilled water.
10. Clearances between individual ducts:
 - a. For similar services, not less than 3 inches.
 - b. For power and signal services, not less than 6 inches.
11. Duct lines shall terminate at window openings in manhole walls as shown on the drawings. All ducts shall be fitted with end bells.
12. Couple the ducts with proper couplings. Stagger couplings in rows and layers to ensure maximum strength and rigidity of the duct bank.
13. Keep ducts clean of earth, sand, or gravel, and seal with tapered plugs upon completion of each portion of the work.
14. Spare Ducts: Where spare ducts are shown, they shall have a nylon pull rope installed. They shall be capped at each end and labeled as to location of the other end.
15. Duct Identification: Place continuous strip of warning tape approximately 12 inches above ducts before backfilling trenches. Warning tape shall be preprinted with proper identification.
16. Duct Sealing: Seal ducts, including spare ducts, at building entrances and at outdoor terminations for equipment, with a suitable non-hardening compound to prevent the entrance of foreign objects and material, moisture, and gases.
17. Use plastic ties to secure cables to insulators on cable arms. Use minimum two ties per cable per insulator.

B. Direct-Burial Ducts:

1. Install direct-burial ducts only where shown on the drawings. Provide direct-burial ducts only for low-voltage power and lighting branch circuits.
2. Tops of ducts shall be:
 - a. Not less than 24 inches and not less than shown on the drawings, below finished grade.

- b. Not less than 30 inches and not less than shown on the drawings, below roads and other paved surfaces.
 - c. Additional burial depth shall be required in order to accomplish NEC-required minimum bend radius of ducts.
- 3. Do not kink the ducts. Compaction shall not deform the ducts.
- C. Connections to Structures: Ducts connecting to structures shall be flared to have an enlarged cross-section to provide additional shear strength. Dimensions of the flared cross-section shall be larger than the corresponding manhole opening dimensions by no less than 12 inches in each direction. Perimeter of the duct bank opening in the manhole shall be flared toward the inside or keyed to provide a positive interlock between the duct and the wall of the manhole. Use vibrators when this portion of the encasement is poured to ensure a seal between the envelope and the wall of the structure.
- D. Connections to Existing Structures: For duct connections to existing structures, break the structure wall out to the dimensions required and preserve the steel in the structure wall. Cut steel and extend into the duct bank envelope. Chip the perimeter surface of the duct bank opening to form a key or flared surface, providing a positive connection with the duct bank envelope.
- E. Connections to Existing Ducts: Where connections to existing ducts are indicated, excavate around the ducts as necessary. Cut off the ducts and remove loose concrete from inside before installing new ducts. Provide a reinforced-concrete collar, poured monolithically with the new ducts, to take the shear at the joint of the duct banks.
- F. Partially-Completed Ducts: During construction, wherever a construction joint is necessary in a duct bank, prevent debris such as mud and dirt from entering ducts by providing suitable plugs. Fit concrete envelope of partially completed ducts with reinforcing steel extending a minimum of 2 feet back into the envelope and a minimum of 2 feet beyond the end of the envelope. Provide one No. 4 bar in each corner, 3 inches from the edge of the envelope. Secure corner bars with two No. 3 ties, spaced approximately 12 inches apart. Restrain reinforcing assembly from moving during pouring of concrete.

3.4 ACCEPTANCE CHECKS AND TESTS

A. Duct Testing and Cleaning:

- 1. Upon completion of the duct installation, a standard flexible mandrel shall be pulled through each duct to loosen particles of earth, sand, or foreign material left in the duct, and to test for out-of-round conditions.
- 2. The mandrel shall be not less than 12 inches long, and shall have a diameter not less than 0.5 inch less than the inside diameter of the duct. A brush with stiff bristles shall then be pulled through each duct to remove the loosened particles. The diameter of the brush shall be the same as, or slightly larger than, the diameter of the duct.
- 3. If testing reveals obstructions or out-of-round conditions, the Contractor shall replace affected section(s) of duct and retest to the satisfaction of the Engineer at no cost to the Government.
- 4. Mandrel pulls shall be witnessed by the Engineer.

SECTION 26 05 43
UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 SUMMARY

- A. Provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install underground duct banks, manholes and handholes including all necessary excavation, backfill and surface restoration.
- B. Provide underground conduit duct banks with manholes and pull boxes for power, and lighting circuits as shown on the Drawings.
- C. Coordination: Duct bank routing when shown on the Drawings is diagrammatic. Coordinate installation with piping and other underground systems and structures and locate clear of interferences. Coordinate manhole and handhole installation with piping, sheet piling and other underground systems and structures and locate clear of interferences.

1.2 REFERENCES

- A. Reference Standards:
 - 1. National Electrical Manufacturers Association (NEMA)
 - 2. The American National Standards Institute (ANSI)
 - 3. The Institute of Electrical and Electronic Engineers (IEEE)
 - 4. Insulated Cable Engineers Association (ICEA)
 - 5. National Electrical Code (NEC)
 - 6. National Electrical Safety Code (NESC)
 - 7. ANSI A14.3, Safety Requirements for Fixed Ladders
 - 8. OSHA
 - 9. ASTM
 - a. ASTM A 48, Gray Iron Castings
 - b. ASTM D756, Procedure E: Accelerated Service Exposure
 - c. ASTM G53: Recommended Practice for Operating Light and Water Exposure on Nonmetallic Materials (with a U.V.A. 340 bulb)
 - d. ASTM D570, Section 5, 6.1, 6.5: Water Absorption
 - e. ASTM D790: Flexural Properties
 - f. ASTM D635: Flammability Test
- B. Definitions:
 - 1. Duct: Electrical conduit and other raceway, either metallic or nonmetallic, used underground, embedded in earth or concrete.
 - 2. Duct bank: 2 or more conduits or other raceway installed underground in the same trench or concrete envelope.
 - 3. Handhole: An underground junction box in a duct or duct bank with cover accessible from grade.

4. Manhole: A n underground utility structure, large enough for a person to enter, with facilities for installing and maintaining cables. Where required manholes shall comply with the Utility Companies requirements.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination, Sequencing, and Scheduling: per Contract Documents.

1.4 SUBMITTALS

- A. Submit in accordance with Division 01 General Requirements.
- B. Shop Drawings:
 1. Layouts showing the proposed routing of duct banks and the locations of manholes, handholes and areas of reinforcement
 2. Profiles of duct banks showing crossings with piping and other underground systems
 3. Typical cross sections
 4. Installation procedures
 5. Manufacturer's technical information for manholes, handholes and accessories proposed for use
 6. Drawings showing interior and exterior manhole and handhole dimensions and details of openings, jointing, inserts, reinforcing, size and locations of openings, and accessory locations
 7. Certificate of concrete and steel used in underground pre-cast concrete utility structures, according to ASTM C858
 8. Product Data for nonmetallic conduit and manhole accessories
- C. Record Drawings:
 1. Layouts showing the actual routing of duct banks including the dimensions and depth of the top of duct bank below grade. Record Drawings for duct banks should also include cross sections of the duct bank indicating the circuit, use, conduit size, orientation and number of conduits.
 2. Locations of manholes, handholes, and areas of reinforcement

1.5 QUALITY ASSURANCE

- A. Provide in accordance with Contract Documents.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Provide in accordance with Contract Documents.

1.7 SITE CONDITIONS

- A. Existing Conditions: per Contract Documents.

PART 2 – PRODUCTS

2.1 DUCT BANK CONDUIT

- A. Duct: Schedule 40 and Schedule 80 PVC conduit and fittings in accordance with Division 26, Section Raceways and Boxes for Electrical Systems.
- B. Rigid Steel Conduit: Rigid steel conduit and fittings in accordance with Division 26, Section Raceways and Boxes for Electrical Systems.

2.2 HANDHOLES

- A. The pull/splice box underground enclosures shall be constructed of polymer concrete consisting of sand and aggregate bound together with a polymer resin. Internal reinforcement may be provided by means of steel, fiberglass, or a combination of the two. Handholes for installation in roadways shall be concrete reinforced H20 traffic rated.
- B. Enclosure:
 - 1. The enclosure must be manufactured with an open or closed bottom and a removable cover. The enclosures shall be green or concrete gray in color.
 - 2. The enclosures shall be designed to be installed flush to grade with the cover fitting flush to the box.
 - 3. The enclosures shall be suitable for installation in either direct or buried native soil, embedded in concrete, or embedded in asphalt surfacing. (A concrete collar is required for installation in asphalt).
 - 4. The enclosures shall be of a stackable design for greater installation flexibility.
 - 5. All covers are to be equipped with a minimum of two stainless steel lockdown mechanisms. All covers shall have a logo recessed into the cover and it shall read ELECTRIC.
 - 6. All enclosure covers will have some type of recessed access point to allow removal of the cover with a hook. The access points will be placed in such a location to allow for the greatest amount of leverage and safety possible.
 - 7. Enclosures shall be designed and suitable for installation and use through a temperature range of minus 40°C (minus 40°F) to 60°C (140°F).
 - 8. A certified copy of all test reports must be signed and stamped by a registered professional Engineer and submitted prior to shipment of products.
- C. Material Requirements:
 - 1. Permanent deflection of any surface shall not exceed 10 percent of the maximum allowable static design load deflection.
 - 2. The covers shall be skid resistant and have a maximum coefficient of friction of 0.50 on the top surface of the cover. Coatings will not be allowed.
 - 3. Any point on the covers must be able to withstand a 70 foot-pound impact administered with a 12-pound weight having a “C” tup (ASTM D-2444) without puncturing or splitting. The test shall be performed with the cover resting on a flat, rigid surface such as concrete or a 1 steel plate.

4. Covers shall have molded lettering, ELECTRIC or COMM as applicable
 5. Fastening devices used to secure the cover to the box shall be capable of withstanding a minimum torque of 15 foot-pounds and minimum straight pullout strength of 750 pounds.
 6. The material is tested according to the requirements of ASTM D543, Section 7, Procedure 1, for chemical resistance. The manufacturer is responsible for proof of compliance with the latest version of the ASTM standards.
 7. Comply with the following acceptance standards:
 - a. ASTM D756
 - b. ASTM G53
 - c. ASTM D570
 - d. ASTM D790
 - e. ASTM D635
- D. Acceptable level of quality for handholes: equivalent to Strongwell Quazite, or approved equal.

2.3 SOURCE QUALITY CONTROL

- A. Provide in accordance with Contract Documents.

PART 3 – EXECUTION

3.1 **GENERAL**

- A. Concrete shall be measured, mixed and placed, and compacted as required in Division 03.
- B. Provide not less than 3 inches of concrete between the outside of a duct and the earth. Provide not less than 2 inches of concrete between adjacent ducts. Refer to Drawings for spacing requirements. Provide side forms for each duct bank.
- C. All duct line concrete pours shall be continuous between manholes or handholes and between manholes or handholes and structures.
- D. Where duct lines pass through concrete walls, concrete envelopes shall be extended through the finished flush with inside surfaces. Watertight construction joints of an approved type shall be provided.
- E. Duct banks shall be reinforced when laid on backfill covering new pipelines, roads, parking lots or any are subject to vehicular traffic. Beneath these areas, install reinforcing bars as shown on the Drawings, extending 10 feet beyond area needing protection.
- F. Duct lines shall be laid in trenches on mats of gravel not less than 6 inches thick and well graded.
- G. All electrical duct banks shall be colored red for safety purposes.
- H. Install raceways to drain away from buildings. Raceways between manholes or handholes shall drain toward the manholes or handholes. Raceway slopes shall not be less than 3 inches per 100 feet.

- I. Make raceway entrances to buildings and vaults with hot dipped rigid galvanized steel conduit not less than 10 feet long. Conduits which are not concrete encased for runs below floor slabs in slab-on-grade construction shall be hot dipped rigid galvanized steel conduit. Conduits which are concrete encased for runs below floor slabs in slab-on-grade construction shall be encased under the slab to their respective equipment.
- J. Raceway terminations at manholes shall be with end bells for PVC conduit and insulated throat grounding bushings with lay-in type lugs for metal conduit.

3.2 PROJECT CONDITIONS AND COORDINATION

- A. Coordination with other Underground Utilities:
 - 1. Locate all existing underground utilities through the use of an underground utility piping location Services Company. Locate the existing underground utilities and piping before any excavation is to begin.
 - 2. Coordinate conduit routing, duct bank and manholes with other new and existing underground utilities. Revise locations and elevations as required to suit field conditions and ensure that conduits, duct runs, manholes, and handholes do not interfere with existing and new underground utilities and piping.

3.3 INSTALLATION

- A. Provide excavation and backfilling required for duct bank manhole and handhole installation.
- B. Make duct bank installations and penetrations through foundation walls watertight.
- C. Assemble duct banks using non-magnetic saddles, spacers, and separators. Position separators to provide 3-inch minimum separation between the outer surfaces of the ducts.
- D. Firmly fix ducts in place during pouring of concrete. Carefully spade and vibrate the concrete to insure filling of all spaces between ducts.
- E. Make bends with sweeps of not less than 48-inch radius or 5 degree angle couplings.
- F. Make a transition from non-metallic to rigid steel conduit where duct banks enter structures or turn upward for continuation above grade. Terminate the ducts in insulated grounding bushings. Continue ducts inside buildings with steel, metallic conduit.
- G. Where ducts enter manholes and handholes, terminate the ducts in suitable end bells.
- H. Provide expansion/deflection fittings in accordance with the requirements specified in Division 26, Section Raceways and Boxes for Electrical Systems.
- I. Do not backfill with material containing large rock, paving materials, cinders, large or sharply angular substances, corrosive material, or other materials that can

damage or contribute to corrosion of ducts or cables or prevent adequate compaction of fill.

- J. Slope duct runs for drainage toward manholes and away from buildings with a slope of approximately 3 inches per 100 feet.
- K. After completion of the duct bank and prior to pulling cable, pull a mandrel, not less than 12 inches long and with a cross section approximately 1/4 inch less than the inside cross section of the duct, through each duct. Then pull a rag swab or sponge through to make certain that no particles of earth, sand or gravel have been left in the duct.
- L. Install a bare stranded copper duct bank ground cable in each duct bank envelope. Make ground electrically continuous throughout the entire duct bank system. Connect ground cable to building and station ground grid or to equipment ground buses. In addition, connect ground cable to steel conduit extensions of the underground duct system. Provide ground clamp and bonding of each steel conduit extension, where necessary to maintain continuity of the ground system. Terminate ground conductor at last manhole or handhole for outlying structures.
- M. Install a warning ribbon approximately 12 inches below finished grade over all underground duct banks. The identifying ribbon shall be a PVC tape, 3 inches wide, yellow color, permanently imprinted with CAUTION BURIED ELECTRIC LINE BELOW in black letters.
- N. Plug and seal all empty spare ducts entering buildings and structures. Seal all ducts in use entering buildings and structures. Seal shall be watertight, O-Z/Gedney Type Dux Duct Sealing Compound or equal.
- O. Install duct banks in conformance with National Electrical Code and National Electrical Safety Code.
- P. Install manholes and handholes where shown on Drawings. Verify final locations in field.
- Q. Complete installation of manholes and handholes so that structures are watertight. Provide expansion/deflection fitting for each conduit entry into the manholes.
- R. Provide sump opening in manhole floor.
- S. Provide grading rings or brick stacks for manholes when required to adjust manhole cover to proper grade. Stacks shall be a minimum of 12 inches in height, constructed on the roof slab or cone section on which the manhole frame and cover shall be placed. The height of the stack shall be such as is necessary to bring the manhole frame to the proper grade.
- T. Cable Racks:
 - 1. Provide cable hooks to support each cable on each rack along the cable run within the manholes.
 - 2. Individually support each cable at each hook on porcelain insulators.
 - 3. In the manhole, securely tie each cable in place at each insulator block to

prevent excessive movement of insulators, cables, or fireproof tape. Tie cables with non-metallic 3/4 inch strapping tape as manufactured by 3M or tie down with nylon straps.

- U. Conduits shall extend 3 inches above concrete slab surface, unless otherwise indicated. All conduits shall be bushed to protect cables and provide means for grounding.
- V. Duct Bank Conduit Spacers: Non-metallic, snap together intermediate and bottom pieces, sized for conduit diameter and code spacing. Carlon Span-Loc or approved equal. Separators shall be compatible with the conduit utilized. The joints of the conduits shall be staggered by rows and layers to provide a duct line having the maximum strength. During construction, partially completed duct lines, shall be protected from the entrance of debris such as mud, sand, and dirt by means of suitable conduits plugs. As each section of a duct line is completed, a testing mandrel not less than 12 inches long with a diameter 1/4 inch less than the size of the conduit, shall be drawn through each conduit, after which a brush having the diameter of the duct, and having stiff bristles shall be drawn through until the conduit is clear of all particles of earth, sand and/or gravel; conduit plugs shall then be immediately installed. Provide a plastic pull rope, having a minimum of 3 additional feet at each end, in all spare ducts.

3.4 DUCT BANK INSTALLATION

- A. All bends shall have a radius greater than 36 inches or 12 times conduit inside diameter whichever is greater.
- B. Install duct with minimum slope of 4 inches per 100 feet. Slope duct away from building entrances.
- C. Install no more than equivalent of three 90-degree bends between pull points.
- D. Provide suitable fittings to accommodate expansion and deflection where required.
- E. Use suitable separators and chairs installed not greater than 4 feet on centers. Conduit separation shall be per code, and not less than 3 inches.
- F. Securely anchor duct to prevent movement during concrete placement. Use re-bar holders at spacers and secure with No. 4 re-bar driven into the earth at a minimum of 1 foot.
- G. Connect to manhole wall using No. 6 re-bar dowels. Dowels shall be located at each corner, and 12 inches on center. Insert dowels minimum 3 inches into manhole and 3 feet into duct bank.
- H. Tops of concrete-encased ducts shall be:
 - 1. Not less than 24 inches and not less than shown on the Drawings, below finished grade.
 - 2. Not less than 30 inches and not less than shown on the Drawings, below roads and other paved surfaces.

- I. Tops of direct burial ducts and conduits shall be:
 1. Not less than 24 inches and not less than shown on the Drawings, below finished grade.
 2. Not less than 30 inches and not less than shown on the Drawings, below roads and other paved surfaces.

3.5 CABLE PULLING

- A. The inspection, handling, storage, temperature conditioning prior to installation, bending and training limits, pulling limits, and calculation parameters for installation of all cables must comply with the manufacturer's recommendations. For ease of installation and prevention of cable damage, the Contractor shall utilize quadrant blocks located properly along the cable run. Failure to comply with any of the above shall make this Contractor responsible for any cable failures that occur within the manufacturer's Warranty Period.
- B. Cable lubricant shall be soapstone, graphite, or talc for rubber or plastic jacketed cables.
- C. Lubricants for assisting in the pulling or jacketed cables shall be those specifically recommended by the cable manufacturer.
- D. Cable pulling tensions shall not exceed the maximum pulling tensions recommended by the cable manufacturer.
- E. All medium voltage cables shall be individually fire/arc proofed.

3.6 CABLE TERMINATING

- A. Terminations of insulated power and lighting cables shall be protected from accidental contact, deterioration of coverings and moisture by the use of terminating devices and materials. Terminations shall be made using materials and method as indicated or specified herein or as designed by the written instruction of the cable manufacturer and termination kit manufacturer.

3.7 GROUNDING

- A. Duct banks shall be grounded with a bare stranded copper ground wire that is run within the duct bank and is bonded and grounded at both ends. Conduit shall not be used as the ground conductor.
- B. Manholes shall be grounded with ground rods. A bare stranded copper ground wire from the ground wire loop shall be used to bond together and ground the manhole cover frame, ladder support bracket, concrete inserts, cable racks, duct bank ground conductors, and the shields of any medium voltage cables that are spliced in the manhole.
- C. Grounding: Install a ground rod for each manhole. Bond all exposed metal manhole accessories and the concrete reinforcing rods with bare copper wire and connect to the ground rod and to the duct bank ground cable. Provide foam sealant for rod penetration in manhole floor for watertight seal.

- D. Install a bare stranded copper duct bank ground cable in each duct bank envelope. Make ground electrically continuous throughout the entire duct bank system. Connect ground cable to building and station ground grid or to equipment ground buses. In addition, connect ground cable to steel conduit extensions of the underground duct system, manholes, and handholes. Provide ground clamp and bonding of each steel conduit extension, where necessary to maintain continuity of the ground system.

3.8 FIELD QUALITY CONTROL

- A. Provide in accordance with Contract Documents.

3.9 STARTUP & COMMISSIONING

- A. Provide in accordance with Contract Documents.

SECTION 26 05 44
SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 – GENERAL

1.1 **SUMMARY**

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

PART 2 - PRODUCTS

2.1 **SLEEVES**

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies shall be galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw fastening the sleeve to the board.

C. Sleeves for Rectangular Openings:

1. Material shall be galvanized sheet steel.
2. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
 - b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 **SLEEVE-SEAL SYSTEMS**

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

Sleeve-seal fittings shall be manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

- A. Grout shall be non-shrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic cement grout.
- C. Design Mix shall be 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07 92 00 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
 - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations shall use steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

- G. Install cast-iron pipe sleeves for underground, exterior penetrations. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

SECTION 26 05 83
WIRING CONNECTIONS

PART 1 - GENERAL

1.1 SCOPE

- A. All equipment shown on the electrical plans shall be wired by the Contractor.
- B. The Contractors shall furnish and install their equipment and the Contractor shall wire them as shown on the plans and per manufacturer's instructions.
- C. All electrical work shall comply with the National Electrical Code (NEC) and all equipment shall be U.L. listed.
- D. Furnish shop drawings of starters, relays, and disconnect switches.
- E. Furnish all wire, conduit, fittings etc. to make all connections and complete all electrical work (equipment by others).

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Disconnects shall be per Section 26 06 20 and this section.
- B. Raceway and conductors shall be per Section 26 05 33, 26 06 20, and 26 27 26.
- C. Motor starter overload heaters sized for the actual motor shall be furnished.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The Contractor shall wire line voltage power and line voltage control wiring to all equipment. The Contractor shall install wiring to the equipment in flexible metallic conduit using liquid tight flexible metal conduit where exposed to moisture.
- B. Control wiring shall be sized and protected as required by the NEC.
- C. The Contractor will furnish fuses sized by the NEC.
- D. Install motor disconnects in sight of the motor or provide lockable disconnects in compliance with the NEC.
- E. All motor disconnects and starters shall have name plates indicating motor being controlled.

SECTION 26 06 20
ELECTRICAL DISTRIBUTION

PART 1 - GENERAL

1.1 **SCOPE**

- A. Furnish and install all panelboards, load centers, disconnect switches, cabinets and boxes as required by the drawings, specifications and by the National Electrical Code (NEC).
- B. Submit shop drawings for all switches, panelboards, and circuit breakers.

PART 2 - PRODUCTS

2.1 **MATERIALS**

- A. Panelboards shall be U.L. listed, have main lugs as sized on plans and shall be furnished with active breakers, spare breakers and space (as shown on the plans). (Meet Fed. Spec. W-P-115a as Type 1). (Panelboards - Class 1).
 - 1. The panels shall have a hinged door with lock and typed directory.
 - 2. Terminal connectors shall be U.L. listed al/cu type.
 - 3. Panels shall be furnished with grounding terminal strip.
 - 4. Flush mounted panels shall have factory furnished trim.
 - 5. Panel boxes shall be code gauge, primed and painted manufacturer's standard finish.
 - 6. Panel boxes shall be of necessary height to accommodate breaker and spaces.
 - 7. Panel breakers shall be U.L. listed quick-make, quick-break, thermal magnetic type.
 - 8. Furnish GFI and/or AFCI circuit breakers where indicated or required by code.
 - 9. All panelboards and circuit breakers must be capable of interrupting fault currents indicated on the panel schedule.
 - 10. Panelboards shall be Square D types as shown on plans, Westinghouse, ITT, General Electric or equivalent.
- B. Small motor disconnects shall be Westinghouse type MS or B101 unless noted otherwise. Fused switches shall be general duty.
- C. Fuses shall be furnished for fused disconnect switches. Fuses shall be of required or specified voltage and current rating. Furnish Owner with one set of spare fuses for all types installed. Current limiting fuses must be installed when indicated.
- D. Disconnect switches shall be at least general duty, U.L. listed, horsepower rated for motors, and be provided in a NEMA 1 enclosure or NEMA 3 R as noted on plans.
- E. Panelboards shall be U.L. listed and shall be flush or surface mounted as indicated on the plans.
- F. Panels, cabinets, and boxes shall be code gauge.
- G. All boxes shall be U.L. listed for intended uses and shall comply with the NEC requirements.
- H. Concealed outlet boxes shall be listed PVC or code gauge galvanized or sheradized metal not less than #14 gauge and sized to the NEC requirements.
- I. Junction boxes shall be of code gauge steel cast or PVC and sized to NEC requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Set all electrical panels or boxes plumb and square with building lines. Mount panelboards so top of uppermost breaker switch is not higher than 6'7" AFF.
- B. Where more than one wiring device is to be mounted, solid gang boxes shall be used.
- C. All wiring shall be done in accordance with the NEC requirements.
- D. All panels shall have typed directories.
- E. The Electrical Contractor shall balance all panels and shall comply with the local utility company requirements.
- F. All disconnects shall be labeled with the use indicated. The label shall be plastic tape with embossed letters.
- G. All breaker panels shall have a plastic nameplate or equal indicating panel name.

SECTION 26 09 23
LIGHTING CONTROL DEVICES

PART 1 – GENERAL

1.1 **SUMMARY**

This section includes time switches, photoelectric switches, indoor occupancy sensors, lighting contactors, etc. for control of lighting.

PART 2 – PRODUCTS

2.1 **TIME SWITCHES**

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Cooper Industries, Inc.
2. Intermatic, Inc.
3. Invensys Controls.
4. Leviton Mfg. Company, Inc.
5. NSi Industries LLC
6. Tyco Electronics
7. Or equal.

2.2 **OUTDOOR PHOTOELECTRIC SWITCHES**

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Cooper Industries, Inc.
2. Intermatic, Inc.
3. NSi Industries LLC
4. Tyco Electronics
5. Or equal.

B. Description: Solid state, with SPST dry contacts to operate connected load.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
3. Time Delay: Thirty-second minimum, to prevent false operation.
4. Lightning Arrester: Air-gap type.
5. Mounting: Twist lock complying with NEMA C136.10, with base.

2.3 **INDOOR OCCUPANCY SENSORS**

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Cooper Industries, Inc.
2. Hubbell Building Automation, Inc.
3. Leviton Mfg. Company, Inc.
4. Lightolier Controls

5. NSi Industries LLC; TORK Products.
 6. Or Equal.
- B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
 4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
 5. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a ½-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 6. Indicator: Digital display to show when motion is detected during testing and normal operation of sensor.
 7. Bypass Switch: Override the “on” function in case of sensor failure.
 8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.
- C. PIR Type: Ceiling mounted; detect occupants in coverage area by their heat and movement.
1. Detector Sensitivity shall detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of not less than 36 sq. in.
 2. Detection Coverage (Room) shall detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch high ceiling.
 3. Detection Coverage (Corridor) shall detect occupancy within 90 feet when mounted on a 10-foot high ceiling.
- D. Ultrasonic Type: Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy.
1. Detector Sensitivity shall detect a person of average size moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches.
 2. Detector Coverage (Small Room) shall detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch high ceiling.
 3. Detection Coverage (Standard Room) shall detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch high ceiling.
 4. Detection Coverage (Large Room) shall detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch high ceiling.
 5. Detection Coverage (Corridor) shall detect occupancy anywhere within 90 feet when mounted on a 10-foot high ceiling in a corridor.
- E. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
1. Sensitivity Adjustment – separate for each sensing technology.

2. Detector Sensitivity shall detect occurrences of 6-inch minimum movement of any portion of human body that presents a target of not less than 36 sq. in., and detect a person of average size moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches.
3. Detection Coverage (Standard Room) shall detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch high ceiling.

2.4 LIGHTING CONTACTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 1. Emerson Electric Co.
 2. Eaton Corporation
 3. Schneider Electric
 4. Or Equal.
- B. Lighting contactors shall be electrically operated and mechanically held, combination-type lighting contactors with nonfused disconnect, complying with NEMA ICS 2 and UL 508.
 1. Current Rating for Switching shall be consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
 2. Fault Current Rating shall be equal to or exceeding the available fault current at the point of installation.
 3. The enclosure shall comply with NEMA 250.
 4. Provide with control and pilot devices.

2.5 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources shall not be smaller than No. 12 AWG.
- B. Classes 2 and 3 Control Cable shall be multi-conductor cable with stranded-copper conductors not smaller than No. 18 AWG.
- C. Class 1 Control Cable shall be multi-conductor cable with stranded-copper conductors not smaller than No. 14 AWG.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.
- B. When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
 1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

SECTION 26 24 16
PANELBOARDS

PART 1 - GENERAL

1.1 **DESCRIPTION**

This section specifies the furnishing, installation, and connection of panelboards.

1.2 **SUBMITTALS**

- A. Submit in accordance with Section 26 05 00, ELECTRICAL PROVISIONS equal to Square D.
- B. Shop Drawings:
 - 1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
 - 2. Include electrical ratings, dimensions, mounting details, materials, wiring diagrams accessories and weights of equipment. Complete nameplate data including manufacturer's name and catalog number.
- C. Certification: Two weeks prior to final inspection, submit four copies of the following to the Engineer:
 - 1. Certification that the material is in accordance with the drawings and specifications has been properly installed, and that the loads are balanced.

PART 2 - PRODUCTS

2.1 **PANELBOARDS**

- A. Panelboards shall be in accordance with UL, NEMA, NEC, and as shown on the drawings and shall be fitted with arc fault and surge protection.
- B. Panelboards shall be standard manufactured products. All components of the panelboards shall be the product and assembly of the same manufacturer. All similar units of all panelboards to be of the same manufacturer.
- C. All panelboards shall be hinged "door in door" type with:
 - 1. Interior hinged door with hand operated latch or latches as required to provide access to circuit breaker operating handles only, not to energized ports.
 - 2. Outer hinged door shall be securely mounted to the panelboard box with factory bolts, screws, clips, or other fasteners requiring a tool for entry, hand operated latches are not acceptable.
 - 3. Push inner and outer doors shall open left to right.
- D. All panelboards shall be completely factory assembled with molded case circuit breakers. Include one-piece removable, inner dead front cover independent of the panelboard cover.
- E. Panelboards shall have main breaker or main lugs, bus size, voltage, phase, top or bottom feed, and flush or surface mounting as scheduled on the drawings.

F. Panelboards shall conform to NEMA 1/3R:

1. Nonreduced size copper or aluminum bus bars, complete with current ratings as shown on the panel schedules connection straps bolted together and rigidly supported on molded insulators.
2. Bus bar connections to the branch circuit breakers shall be the "distributed phase" or "phase sequence" type. Three-phase, four-wire busing shall be such that when any three adjacent single-pole breakers are individually connected to each of the three different phases, two-or three-pole breakers can be installed at any location. Current-carrying parts of the bus assembly shall be plated. Mains ratings shall be as shown.
3. Mechanical lugs furnished with panelboards shall be cast, stamped, or machined metal alloys of sizes suitable for the conductors indicated to be connected thereto.
4. Neutral bus shall be mounted on insulated supports.
5. Grounding bus bar equipped with screws or lugs for the connection of grounding wires.
6. Buses braced for the available short circuit current, but not less than 22,000 amperes symmetrical for 120/208 volt, and 14,000 amperes symmetrical for 277/480-volt panelboards.
7. Branch circuit panels shall have buses fabricated for bolt-on type circuit breakers.
8. Protective devices shall be designed so that they can be easily replaced.
9. Where designated on panel schedule "spaces", include all necessary bussing, device support and connections. Provide blank cover for each space.
10. In two section panelboards, the main bus in each section shall be full size. The first section shall be furnished with subfeed lugs on the line side of main lugs only, or through-feed lugs for main breaker type panels, and with cable connections to the second section. Panelboard sections with tapped bus or crossover bus are not acceptable

2.2 CABINETS AND TRIMS

A. Cabinets:

1. Provide galvanized steel cabinets to house panelboards. Cabinets for outdoor panels shall be factory primed and suitably treated with a corrosion-resisting paint finish meeting UL 50 and UL 67.
2. Cabinet enclosure shall not have ventilating openings.
3. Cabinets for panelboards may be of one-piece formed steel or of formed sheet steel with end and side panels welded, riveted, or bolted as required.

2.3 MOLDED CASE CIRCUIT BREAKERS FOR PANELBOARDS

A. Breakers shall be UL 489 listed and labeled, in accordance with the NEC, as shown on the drawings, and as specified.

B. Circuit breakers in panelboards shall be bolt on type on phase bus bar or branch circuit bar.

1. Molded case circuit breakers for lighting and appliance branch circuit panelboards shall have minimum interrupting rating as indicated but not less than:
 - a. 120/240 Volt Panelboard: 22,000 amperes symmetrical.
 - b. 277/480 Volt Panelboard: 14,000 amperes symmetrical.
2. Molded case circuit breakers shall have automatic, trip free, non-adjustable, inverse time, and instantaneous magnetic trips for 100-ampere frame or less. Magnetic trip shall be adjustable from 3X to 10X for breakers with 600 ampere frames and higher.

C. Breaker features shall be as follows:

1. A rugged, integral housing of molded insulating material.
2. Silver alloy contacts.
3. Arc quenchers and phase barriers for each pole.

4. Quick-make, quick-break, operating mechanisms.
5. A trip element for each pole, thermal magnetic type with long time delay and instantaneous characteristics, a common trip bar for all poles and a single operator.
6. Electrically and mechanically trip free.
7. An operating handle which indicates ON, TRIPPED, and OFF positions.
 - a. Line connections shall be bolted.
 - b. Interrupting rating shall not be less than the maximum short circuit current available at the line terminals.
8. An overload on one pole of a multipole breaker shall automatically cause all the poles of the breaker to open.
9. Shunt trips shall be provided where indicated.

2.4 SEPARATELY ENCLOSED MOLDED CASE CIRCUIT BREAKERS

- A. Where separately enclosed molded case circuit breakers are shown on the drawings, provide circuit breakers in accordance with the applicable requirements of those specified for panelboards.
- B. Enclosures are to be of the NEMA types shown on the drawings. Where the types are not shown, they are to be the NEMA type most suitable for the environmental conditions where the breakers are being installed.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be in accordance with the Manufacturer's instructions, the NEC, as shown on the drawings, and as specified.
- B. Locate panelboards so that the present and future conduits can be conveniently connected. Coordinate the sizes of cabinets with designated closet space.
- C. Install a typewritten schedule of circuits in each panelboard after being submitted to and approved by the Engineer. Schedules, after approval, shall be typed on the panel directory cards and installed in the appropriate panelboards, incorporating all applicable contract changes pertaining to that schedule.
- D. Mount the panelboard fully aligned and such that the maximum height of 78 inches.
- E. For panelboards located in areas accessible to the public, paint the exposed surfaces of the trims, doors, and boxes with finishes to match surrounding surfaces after the panelboards have been installed.
- F. Directory-card information shall be typewritten to indicate outlets, lights, devices, and equipment controlled and final room numbers served by each circuit and shall be mounted in holders behind protective covering.

SECTION 26 27 26
WIRING DEVICES

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Weather-resistant receptacles.
3. Snap switches and wall-box dimmers.
4. Wall-switch and exterior occupancy sensors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers are equal to:

1. Cooper Wiring Devices
2. Hubbell Incorporated
3. Leviton Mfg. Company Inc.

B. Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596, equal to commercial grade Leviton.

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FSW-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
4. GFCI receptacles in damp and wet locations shall be rated weather resistant per NEC.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Available products or equal that may be incorporated into the work include the following:
 - a. Cooper; VGF20.
 - b. Hubbell; GFR5352L.
 - c. Leviton; 7590.

2.5 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Available products or equal that may be incorporated into the work include the following:
 - a. Single Pole:
 - 1) Cooper; AH1221.
 - 2) Hubbell; HBL1221.
 - 3) Leviton; 1221-2.
 - b. Two Pole:
 - 1) Cooper; AH1222.
 - 2) Hubbell; HBL1222.
 - 3) Leviton; 1222-2.
 - c. Three Way:
 - 1) Cooper; AH1223.
 - 2) Hubbell; HBL1223.
 - 3) Leviton; 1223-2.
 - d. Four Way:
 - 1) Cooper; AH1224.
 - 2) Hubbell; HBL1224.
 - 3) Leviton; 1224-2.

2.6 WALL-BOX DIMMERS

- A. Dimmer Switches shall be modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
- B. Dimmers shall have a continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.
- C. Fluorescent Lamp Dimmer Switches are to be modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

2.7 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 1. Plate-Securing Screws shall be metal with head color to match plate finish.
 2. Material for Finished Spaces shall be 0.035-inch- thick, Type 302 stainless steel.
 3. Material for Unfinished Spaces shall be galvanized steel.
 4. Material for Damp Locations shall be cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plate shall be NEMA 250, complying with Type 3R, weather-resistant, diecast aluminum with lockable cover.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
 - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.
 - 5. Conceal all wiring.
- D. Device Installation:
 - 1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
 - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
 - 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
 - 6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
 - 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
 - 8. Tighten unused terminal screws on the device.
 - 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
 - 10. Provide sound gaskets in STC rate partitions
- E. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

F. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates. Devices for adjacent rooms in STC partitions shall not share a common stud bay.

H. Adjust locations of service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 FIELD QUALITY CONTROL

A. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

B. Wiring device will be considered defective if it does not pass tests and inspections.

SECTION 26 27 28
DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 **SECTION INCLUDES**

- A. Disconnect Switches.
- B. Fuses.
- C. Enclosures.

1.2 **REFERENCES**

- A. NEMA Standards.
- B. NFPA 70 (N.E.C.) Latest Edition.
- C. U.L. Standards.
- D. ANSI Standards.

1.3 **PERFORMANCE REQUIREMENTS**

- A. Conform to requirements of ANSI/NFPA 70. (N.E.C.)
- B. Furnish products listed and classified by Underwriters' Laboratories, Inc. (U.L.) as suitable for purpose specified and shown.
- C. Size per N.E.C. and Equipment Manufacturers' Recommendations.

1.4 **SUBMITTALS**

- A. Submit Shop Drawings, Owner's Manuals, and Operating Instructions in accordance with Division 01 Section "Submittal Procedures."
- B. Include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit.

1.5 **SPARE PARTS**

- A. Fuses: Furnish to Owner three (3) spare fuses for each circuit and each device requiring fuses. Maximum of six (6) spare fuses of each type and rating installed.
- B. Fuse Pullers: Furnish one fuse puller to Owner.

PART 2 - PRODUCTS

2.1 **DISCONNECT SWITCHES**

- A. Acceptable Manufacturers:
 - 1. Cutler Hammer.
 - 2. I-T-E Siemens.
 - 3. General Electric.
 - 4. Square D.

- B. Fusible Switch Assemblies: Heavy-duty, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: Designed to accommodate Class R fuses.
- C. Nonfusible Switch Assemblies: Heavy-duty, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
- D. Rated: Horsepower rated, 600-volt and 250-volt as required by the particular circuit with ampere rating and number of poles as indicated, or as required by the specific equipment.
- E. Enclosures: NEMA KS 1; Type 1 for interior dry locations, Type 3R rain tight for exterior locations and types as indicated on Drawings.

2.2 FUSES

- A. Acceptable Manufacturers:
 - 1. Bussman.
 - 2. Gould Shawmut.
 - 3. Littelfuse.
- B. Fuses 600 Amperes and Less: Dual element time delay current limiting Class RK1 (Fast Acting); RK5 (Dual Element Time Delay); 600 volt.
- C. Interrupting Rating: 200,000 RMS amperes.

2.3 FUSE CABINET

- A. Fuse Cabinet: Sized to contain all spare fuses required plus 25% room for future use. Provide with engraved nameplate.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. See Section Division 26 for Equipment Wiring.
- B. Install fuses in fusible disconnect switches.
- C. Mount fuse cabinet in main electrical room.

SECTION 26 51 00
INTERIOR LIGHTING - LED

PART 1 - GENERAL

1.1 SCOPE

- A. Drawings and general provisions of the Contract, Standard General and Supplementary General Conditions, Division 1 Specification Sections, and other applicable Specification Sections.
- B. The complete lighting system will consist of indoor lighting, outdoor lighting with all necessary fixtures, switches, sensors, etc.
- C. All devices shall be U.L. listed and approved for the location and application. All wiring methods and materials shall comply with the National Electrical Code (NEC) requirement.
- D. The Electrical Contractor shall submit shop drawings of all light fixtures and lamps.

1.2 SUBMITTALS

- A. Product Data: Arrange in order of luminaire designation. The submittals shall include data on features, ratings, listings, certifications, accessories, finishes, dimensions, emergency components, photometric data, and luminaire efficiency data.
- B. Installation, Operation, and Maintenance Manuals.

1.3 QUALITY ASSURANCE

- A. Lighting fixtures shall be of specification grade and listed or labeled by Underwriters Laboratories (UL) or an approved Nationally Recognized Testing Laboratory (NRTL).
- B. LED fixtures shall comply with the following:
 - 1. UL Standard 8750 "Light Emitting Diode Equipment for Use in Lighting Products", IES Standard LM-79 "Electrical and Photometric Measurements of Solid-State Lighting Products", IES Standard LM-80 "Measuring Lumen Maintenance of LED Light Sources", and IES Standard TM-21 "Projecting Long Term Lumen Maintenance of LED Light Sources".
 - 2. ANSI C78.377 "Specifications for the Chromaticity of Solid State Lighting Products" with LEDs binned within a maximum three-step MacAdam Ellipse to ensure color consistency amongst luminaires of the same type.

1.4 WARRANTY

For fixtures, lamps, drivers, and components, provide a complete warranty for parts and labor for a minimum of five years from the date of Substantial Completion.

PART 2 – PRODUCTS

2.1 LIGHTING

- A. Provide lighting fixtures in accordance with the Fixture Schedule.
 - 1. Provide only LED fixtures with a U.S. Environmental Protection Agency (EPA) Energy Star label.

- B. Recessed lighting fixtures shall be thermally protected.
- C. LED fixtures shall be modular and allow for separate replacement of LED lamps and drivers. User serviceable LED lamps and drivers shall be replaceable from the room side.
- D. Dimmable LED fixtures shall have a 0-10 volt, 3-wire dimming driver.

2.2 LAMPS

- A. LED lamps shall have a color temperature of 4000 degrees K, a CRI of 80 minimum, and a lumen maintenance L70 rating of 50,000 hours minimum unless noted otherwise.
- B. Retrofit LED lamps shall comply with NEMA SSL 4 "SSL Retrofit Lamps: Suggested Minimum Performance Requirements".

2.3 DRIVERS

- A. LED drivers shall be electronic-type, labeled as compliant with radio frequency interference (RFI) requirements of FCC Title 47 Part 15, and comply with NEMA SSL 1 "Electronic Drivers for LED Devices, Arrays, or Systems". LED drivers shall have a sound rating of "A", have a minimum efficiency of 85%, and be rated for a THD of less than 20 percent at all input voltages.
- B. Dimmable LED drivers shall be 0-10V type. Dimmable LED drivers shall be capable of dimming without LED strobing or flicker across their full dimming range.
- C. Drivers shall be rated for the ambient temperatures in which they are located. Outdoor fixtures shall be equipped with ballasts or drivers rated for reliable starting to -20 degrees F. Indoor fixtures located in areas with direct sunlight or above normal ambient temperatures shall have ballasts or drivers rated at 65 degrees C minimum.
- D. Drivers shall have their fuses accessible from outside of the fixture chassis.
- E. Induction lamp drivers shall be electronic and comply with radio frequency interference (RFI) requirements of FCC Title 47 Part 15 and be rated for a total harmonic distortion (THD) of less than 20 percent at all input voltages.

2.4 EMERGENCY LIGHTING

- A. Emergency Lighting shall be at a minimum those fixtures that illuminate the pathway of egress, including building mounted fixtures lighting at exits and sidewalk paths.
- B. Emergency Lighting shall consist of normal lighting fixtures with generator or battery-inverter system backup, emergency lighting fixtures with individual battery backup, or sealed beam emergency lighting units in accordance with the Fixture Schedule. Emergency lighting shall be installed at all exits.
 - 1. Battery-backed LED emergency lighting fixtures shall consist of a normal LED fixture with some or all of the LEDs connected to a battery and charger. The battery shall be nickel cadmium and sized for a minimum of 90 minutes of fixture operation. The charger shall be solid-state and provide overload, short circuit, brownout, and low battery voltage protection. The battery and charger shall include self-diagnostic and self-exercising circuitry to exercise and test itself for 5 minutes every month and for 30 minutes every 6 months. The fixture shall include a test/monitor module with LED status indicating lights mounted to be visible to the public. The fixture shall not contain an audible alarm.

2. Emergency lighting shall maintain a minimum of 1 FC average output in spaces served.
3. Sealed beam emergency lighting units shall consist of sealed beam LED lamps connected to an internally mounted battery and charger. The battery shall be nickel cadmium and sized for a minimum of 90 minutes of battery operation. The charger shall be solid-state and provide overload, short circuit, brownout, and low battery voltage protection. The unit shall be suitable for wall or ceiling mounting as required. The unit shall include a test/monitor module with LED status indicating lights mounted to be visible to the public. The unit shall not contain an audible alarm.

2.5 EXIT SIGNS

- A. Exit signs shall be of the LED type. Fluorescent, electro luminescent light panel, or self-powered luminous signs shall not be used.
 1. LEDs shall be wired in parallel to prevent multi-lamp failure and shall be concealed within the sign by a clear panel and red optical diffuser. Power consumption shall not exceed 2 watts per face.
 2. Exit signs shall have white die cast aluminum or polycarbonate housings with universal mounting brackets; brushed aluminum stencil faces with red letters and multi-directional knockout arrows.
 3. Exit signs shall be provided with emergency battery packs and battery chargers. Batteries shall be maintenance-free nickel cadmium and shall be mounted within the signs.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

- A. Support recessed troffers independently of the ceiling grid system by using two safety wires minimum on diagonally opposite corners of the fixtures. Support recessed downlights by using safety wires or by rigidly attaching the fixtures to the building structure or ceiling grid system. Removable T-bar clips shall not be used to attach fixtures to the ceiling grid system.
- B. Install fixtures level, with no gaps between adjacent fixtures or between fixtures and surrounding surfaces. Lenses, reflectors, and trims of fixtures shall be properly and uniformly aligned.
- C. Where fixtures are shown with dual switches, control all inner lamps with one switch and all outer lamps with the other switch. Where dimming or occupancy sensor-controlled fixtures are shown, control the fixtures in accordance with the appropriate wiring diagram or manufacturer's instructions.
- D. Connect night light fixtures and emergency lighting fixtures to the hot (unswitched) side of lighting circuits.
- E. Provide an individual feed with ground conductor from a junction box to each lighting fixture. Lighting fixtures shall not be daisy-chained.
- F. Drops to recessed fixtures may be flexible metallic conduit, or manufactured wiring systems may be used where accessible. Fixtures shall be provided with sufficient length to permit removal and lowering of the fixtures 12" below the ceiling.
- G. Provide green grounding conductors back to the panel ground for lighting circuits. Raceways shall not be used as grounding conductors.

- H. Fixtures shall have their exterior labels removed and shall be thoroughly cleaned. Burned out lamps shall be replaced.
- I. Locate emergency lighting remote battery packs and remote test/monitor modules identically so their status indicating lights are visible to the public and they form a straight line when viewed from the end of the corridor or room. Where a suspended ceiling exists, center the status indicating lights in adjacent ceiling tiles.
- J. Mount sealed beam emergency lighting units where shown and aim their lamps to light the egress path as uniformly as possible.
- K. When emergency lighting fixtures contain audible alarms, disable the alarms in accordance with manufacturer's instructions.

3.2 FIELD QUALITY CONTROL

- A. A visual inspection shall be performed to verify cleanliness and alignment of the fixtures. Misalignment and light leaks shall be corrected, and rattles due to ventilation system vibration shall be eliminated.
- B. Perform an operational test to verify that all fixtures illuminate properly, dimming systems dim properly (i.e., no flicker), and lighting zones are switched according to the drawings.

SECTION 27 00 00
COMMUNICATIONS

PART 1 GENERAL

1.1 **DESCRIPTION**

- A. All cabling for voice and data will be CAT6. The general building contractor shall provide Inside Plant (ISP) pathways, which may include accessible utility corridors, finished and exposed metal cable tray or ladder, enclosed conduit, duct, or raceway including pull ropes to allow the installation of cable. Junction boxes shall be provided to allow installation of termination jacks at each station. The general contractor shall provide dedicated building closets, equipment backboards, wire management supports, termination racks, a grounding system, and an Outside Plant (OSP) conduit with pull ropes from the Building Distribution Frame (BDF) to nearest manhole.
- B. US:IT will refer to the cable, which carries Telecommunications System signals, either integrated voice/data or voice only signals, as "voice" cable, i.e. voice riser, voice station cable.
- C. ISP/OSP bid submittals shall include all costs for construction material, labor and any other items required for ISP/OSP installation.
- D. The Contractor will be responsible for implementing all ISP/OSP per the design layout and specifications in its proposal. The design of all pathways and hardware shall allow for a 50% growth in capacity. This responsibility includes installation and termination of all ISP/OSP cabling to their proper equipment.
- E. Particular consideration is to be given to the restoration of penetrated fire and smoke stop partitions and floor slabs to their original condition or to current fire code standards, whichever is greater.
- F. The Contractor shall furnish blueprints, schedules, and other technical data in order to illustrate to US:IT the intended method of installation. These shall define material type, path and concealment methods, distribution cable quantities, and room or wall space requirements. This information will be submitted prior to starting any portion of work and is subject to the approval of **US:IT department**.

1.2 **DEFINITIONS**

- A. Inside Plant (ISP) is defined as intra-building distribution of cable media such as riser cable both fiber and copper coax, station cable, station jack hardware, Intra building Distribution Frame (IDF) terminals, sleeves, conduit, raceways, distribution frame hardware, etc. All other physical plant such as grounding, power, conduit, and raceway not considered OSP are part of the ISP.
- B. Outside Plant (OSP) are all facilities used to support inter-building connections, including (but not limited to) copper, fiber and coaxial cable, splices, terminators, pairs protection, grounding systems, ducts, conduits, manholes, and all related outside infrastructure. Also included are Main Distribution Frames (MDF) and Building Distribution Frames (BDF).
- C. Voice Cable – Cabling, which carries Telecommunications System signals, either integrated voice/data or voice only signals, i.e. voice riser, voice station cable.
- D. Data Cable – Cabling, which carries data communications signals, i.e. data riser, data station cable, data fiber.
- E. Video Cable – Cabling, which carries video or TV communications signals, i.e. video riser, video station cable, video coax.
- F. Approved contractor – The bidder shall be Cat 6 certified. Also, must have a minimum of 5 years telecommunications/data installation experience. Cabling technicians must be certified installers. No more than one helper per certified installer. Certification of technicians must be shown if requested.

1.3 REFERENCES

- A. All work shall meet all applicable codes and standards.
 - 1. National Fire Protective Assoc. (NFPA) 70.
 - 2. Building Industry Consulting Service International (BICSI) Standards.
 - 3. National Electrical Manufacturers Assoc. (NEMA) Standards.
 - 4. Electronics Industry Assoc./Telecom. Industry Assoc. (EIA/TIA).
 - 5. US:IT requirements.

PART 2 PRODUCTS

2.1 OSP – DUCT SYSTEM

- A. The Contractor shall be prudent in the design and installation and use of all available industry techniques to fully utilize individual ducts or raceways and avoid using existing spare ducts or raceways where feasible.
- B. Each duct bank shall consist of three 4” conduits to each building. The duct bank sizing reflects the installation of video coax, data fiber, and voice cable. Contractors shall install Type C (Carlson 68515WH) and industry approved fittings. One 1¼” three cell maxicell shall be installed in one 4” conduit.
- C. Where sharp bends or turns are required, prefabricated fittings will be used unless such bends or turns prohibit the pulling of large cables. In such cases, manholes or hand holes shall be installed.
- D. Rigid conduit will be used where ducts run under roadways. Where conduits are installed in concrete slabs or where the minimum required depth is not feasible. All 4” Rigid conduits will extend a minimum of 10’ past the outside wall and attach to ducts feeding the building.
- E. The duct systems shall be sloped to permit penetrating water to drain towards the manhole(s). The highest point of the duct array will be at the building entry point. All duct systems will be marked with the appropriate marking tape on top. There must be a minimum of 4 inches of sand above the conduits before backfilling.
- F. All unused ducts shall be provided with removable conduit plugs or equivalent for waterproofing and protection. All ducts shall be cleaned of earth and debris, and equipped with minimum 200-pound strength pull rope.
- G. All cables entering ducts shall be sealed according to industry standards and provide a watertight seal.

2.2 MANHOLES AND HAND HOLES

- A. New manholes shall be reinforced concrete construction, cast-in-place or pre-cast, and must meet industry standards for telephone manholes.
- B. The manholes/hand holes sizes shall be a minimum of 4’ x 4’ x 4’, up to a maximum of 6’ x 12’ x 7’ (see manhole/conduit drawings for manholes sizes and locations).
- C. A PVC water barrier shall be installed at each construction joint.
- D. Maximum distances between manholes and from manhole to buildings shall not be great than 600 feet for a run containing an aggregate of a 45-degree bend and 400 feet for runs having an aggregate of a 90-degree bend.
- E. On straight sections maximum distance between manholes shall be no greater than 600 feet.
- F. Manhole lids will be permanently marked with the word “Telecom” or “Communications.”
- G. Each manhole must have an integral 7/8” inch steel ring 6” diameter as part of the manhole

structure. A 12-inch circular sump hole must also be included at the lowest point in a manhole.

H. All manhole covers must meet industry standards for vehicular traffic loads.

2.3 TRENCHING, BACK-FILLING AND RESTORATION OF GROUNDS

- A. Trenching shall be done using trenching machines or backhoes and supplemented by hand excavation where required in order to avoid utility disruption.
- B. Ducts shall be placed on top of four inches (4") of sand bedding at the bottom of each duct run. An additional four inches (4") of sand shall be placed around and between ducts. A final four inches (4") of sand shall be placed on top such that an aggregate of twelve inches (12") exists from the floor of the duct trench and the top of the last four inches (4") of sand.
- C. Below finished grade, just on top of the final layer of sand, and offset from the center of the duct bank, the Contractor shall place one (1) continuous plastic marking strip labeled "Communications."
- D. Gravel backfill shall be used in paved areas and earth shall be used in lawn area. Backfill shall be free of large stones of 3" in diameter or greater.
- E. All backfill materials shall be compacted 95%.
- F. The Contractor shall repair all the University grounds and property to their pre-construction condition using materials of same or better quality. This includes, but is not limited to, re-paving, re-seeding, walls, fences, landscaping, utilities, signs, painting, curbing, etc.
- G. Bituminous materials should be used where necessary for repairing roads, parking areas, and footpaths. The materials shall be provided in two (2) courses: two 2" binders and a 1" surface course. All existing paths and roadways of greater depth shall be repaired to match existing materials and depths.
- H. US:IT reserves the right to inspect all materials to be used in the process required in this section on trenching, backfilling, restoration of grounds, and to demand changes in type and quality in order to meet US:IT standards. Such changes will be at the Contractor's expense unless US:IT requires materials of a higher quality than originally required by this document. In all cases concerning determination of "original condition", US:IT will be the judge and have final approval.
- I. Trench depth, from the bottom of the trench to the top of finished grade will be three feet, eight inches (3' 8") under pavement, and two feet, two inches (2' 2") under finish grade.

2.4 CABLE IDENTIFICATION AND LABELING

- A. After final acceptance, Contractor will prepare and submit cable OSP drawings. These site drawings will be supplied on reproducible materials, and the Contractor will add its distribution system and show at a minimum:
 - 1. Exact route of total outside plant including trenching routes.
 - 2. Depth of cable trench.
 - 3. Locator coordinates measurements from cable location to nearest building.
 - 4. Cable number, cable pair count, wire gauge, cable lengths, and cable types of every OSP copper, coax and fiber cable included in the system.

2.5 OSP CABLE SIZING

- A. Contractor will design an OSP that is complete.
 - 1. **All** OSP pairs must be terminated in Northern 191 or CIRCA #2200B-100 fuse protectors.
 - 2. **All** fiber cable shall be Hitachi 12 multi-mode 62.5/125 and 12 single-mode fibers or as specified.
 - 3. **All** cable shall be rated for outside usage in duct systems.

2.6 CABLE TYPE, SPLICES AND PROTECTION

- A. All Copper cable used in OSP shall be waterproof with moisture and heat resistant properties up to 125 degrees, Gel-Filled Core Duct/Direct Burial type, with a Metal Clad composition. All wire shall be Twisted Pair type PE89 jelly filled 24 AWG solid copper cables.
- B. All splice connections in manholes shall be placed in re-enterable waterproof closures and sealed according to manufacturer's specifications. All splices shall be made with 3M modular connectors (4000-D) and enclosed in "Preform" enclosures.
- C. All OSP will be properly grounded according to NEC Codes and BICSI Standards, and Local Codes and industry standards. All ground connections are subject to the inspection and approval of the US:IT, as well as State and Federal Inspectors.
- D. All OSP will be enclosed in conduit or raceway where appropriate, such as required by Fire Codes, exposed to steam pressure relief valves, or in public areas.

2.7 ADMINISTRATIVE AND ACADEMIC BUILDING OSP DATA FIBER SIZING

- A. Fiber cables shall be pulled to the BDF.
- B. All fiber cables shall be properly terminated at the BDF.
- C. In the fiber installation there will be no splices in the fiber cable, other than those at termination points.
- D. All fiber cable shall be Hitachi 12 multi-mode 62.5/125 and 12 single-mode fibers or as specified.

2.8 OSP – VIDEO CABLE SPECIFICATIONS

- A. All video cables for OSP will be Hitachi single-mode fiber.
- B. Video fibers shall terminate on SC/APC fiber optic connectors.

2.9 CONFIGURATION AND SPECIFICATIONS FOR ISP

- A. Where existing sleeves, riser conduit, etc., are insufficient for new riser cable, construction of new sleeves, cores, and conduit or raceway shall be proposed and included in the contractor's purchase price. A minimum of twelve inches is required between all phone/data services and any electrical circuits. This is a US:IT requirement.
- B. There must be a 50% growth factor built in on all conduit runs used for Voice, Data and Video jacks. Minimum conduit for station runs will be 1" trade size conduit with proper fittings. A 1" NMT non-metallic tubing properly installed meeting all NMT requirements of NEC/BISCI and the University of Maine is also acceptable. There will be NO DAISY CHAINING of jacks for any reason. A pull string needs to be installed in all conduits used for ISP/OSP cabling.
- C. Open Ceiling – All conduits will be installed above the tray or back to the proper IDF/BDF.
- D. Suspended Ceiling – All conduits will be stubbed above the ceiling or back to proper IDF/BDF. Install B-Line cable tray in all corridors providing a continuous pathway back to the proper BDF/IDF.
- E. All old cables are to be removed as required by the NEC.

2.10 CABLE ROUTING

- A. It is mandatory that the contractor makes use of and provides cable pathway materials between all building MDFs, BDFs or IDFs. A 50% growth factor must be provided when a job is completed. A minimum of 12 inches shall be kept between all data and electrical pathways when being designed (US:IT requirements).

- B. Such pathway materials may include:
 - 1. Finished and exposed metal cable tray, ladder, or raceway.
 - 2. Enclosed conduit or wireway through walls or ceiling plenums.
 - 3. Sleeves and conduit.
 - 4. Other materials as the contractor may require.
- C. Provide B-Line – Part # FT2X12X10. Must be mounted no more than 12” above suspended ceiling, or 8’ 6” in open corridors. A usable pull string is to be left in each cable tray on completion of cable installation.
- D. It should be noted that US:IT will not supply pathway materials.
- E. All raceways used for Telecom/Data shall be **Panduit**. They shall be sized properly for use. ONLY proper fittings for raceway shall be used.

2.11 CAT 6 REQUIREMENTS AND PARTS

- A. All data cables shall be CAT6 Hitachi part # 30212-8.
- B. All data cables installed shall be Hitachi part # 30212-8BL CAT6 with a PVC jacket being **blue**.
- C. All dorm jacks shall be installed at 33” to bottom.
- D. All E&G building jacks shall be installed 16” to the bottom.
- E. All CAT6 cable shall be installed according to the NEC code, BICSI standards and EIA/TIA standards.
- F. All CAT6 cable shall be installed on **blue** Hitachi part # 30212BL and terminated on Panduit jacks, part # CJ688PBB.
- G. All CAT6 cable shall be 23 AWG and 8 conductors terminated as 568-A standards allow.
- H. All raceway installed to be used for CAT6 installation must meet all BICSI standards as well as ANSI/TIA/EIA standards.
- I. Cables shall terminate in proper Siemon part # HD6-24B-SIE patch panels rated for CAT6 specs, RJ45 faceplates with 110 terminations on back.
- J. Patch cables rated for CAT6 100mb are to be supplied and installed.
- K. CAT6 certification must be received prior to final payment.
- L. Velcro required to tie and support cables.
- M. All raceways for IT shall be properly sized for **Panduit** or 1” conduit.

2.12 DISTRIBUTION FRAME REQUIREMENTS

- A. New IDF and BDF room construction shall be included in Building Design blueprints.
- B. There shall be included, in the building, an equipment room as designated by US:IT strictly for data telecommunications. All BDF and IDF rooms shall be a minimum of 8’ x 10’ x 8’, with signage indicating that the room is a data telecommunications facility.
- C. An IDF room will be required per floor in order to keep distance requirements for CAT6 wiring within specifications. This room(s) shall be keyed to the telecommunications master key. A 50 pair feeder cable for voice shall be run to the BDF room from each IDF room. These cables should run in pipe chases of 4” conduits. A 12/12 fiber riser cable will be run from BDF to each IDF for data feed. BICSI and NEC standards and US:IT requirements must be met. RJ11 coax

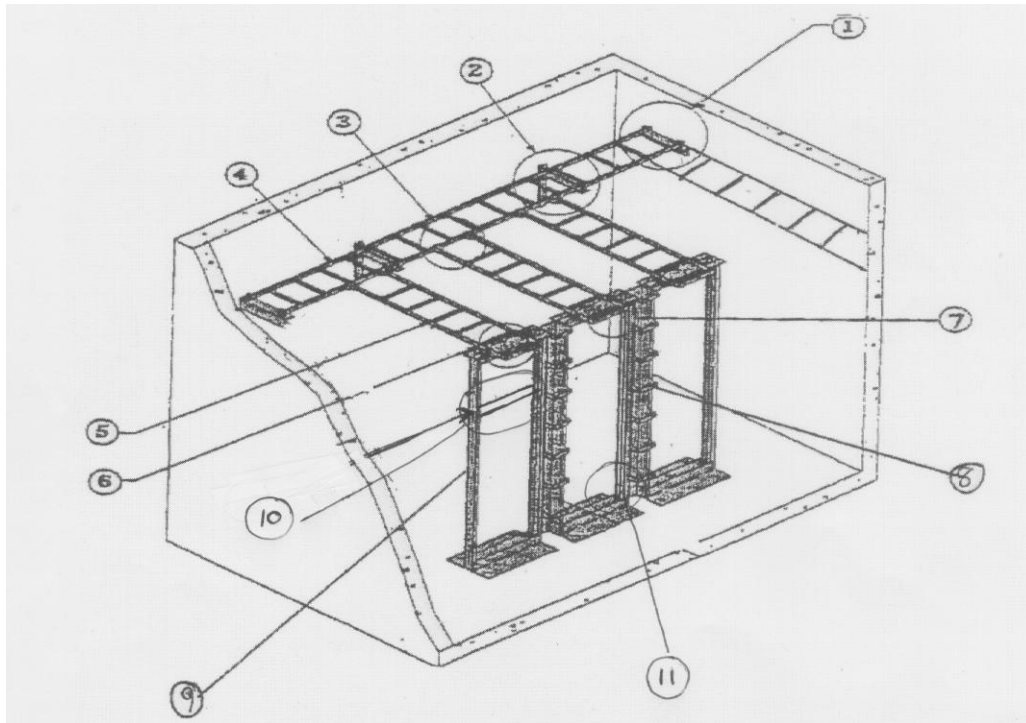
shall be installed to each IDF from the BDF. Air temperature and air movement should meet office requirements for the building.

- D. BDF/IDF rooms should have a switched light with 50 ft. candles available and at least two isolated duplex outlets rated for 20 amps. A covered # 6 copper ground wire and bus bar must be installed at each IDF from main grounding frame in BDF and from racks installed at each IDF/BDF.
- E. A # 4 copper ground wire, properly installed and terminated, will be required in all BDF rooms, part # SB477K.
- F. Two 4" conduits from BDFs to IDFs with pull strings installed.
- G. Three 4" conduits feeding BDF from OSP manholes.
- H. All conduit, raceway, coring, and equipment backboards must be supplied and installed by the Contractor.
- I. Contractor will be required, prior to start of project, to submit a floor-by-floor list of where new BDFs and IDFs will be required.
- J. No sprinkler heads should be installed within the BDF/IDF rooms. Heat/smoke detectors should be installed where necessary for fire code compliance.
- K. All cable will be marked clearly and legibly at both ends.
- L. All cables and fiber shall be terminated on a 7' x 30' x 19' rack. All installed equipment shall meet all BISCII requirements as well as US:IT requirements. All racks shall be properly bonded to ground bar in IDF/BDF rooms.
- M. One wall having a 4' x 8' x 3/4" sheet of plywood attached painted with fire retardant paint is required in the BDFs and IDFs. Plywood should be vertically mounted behind the racks installed 2' off the finished floor.
- N. Wire management hardware located on three (3) walls above the racks is required in preparation of installation of termination equipment by the contractor (see diagram included in this document BDF/IDF requirements closet).
- O. Single-mode fiber will be fusion spliced to factory ceramic SC and SC/APC pigtails.
- P. Multi-mode fiber will be terminated using ST Unicams factory polished ceramic.
- Q. All fiber patch panels are to be Seicore, sized to accept fibers from the OSP plant as well as riser for the IDFs.
 - 1. Data telecommunication rooms (including but not limited to BDF and IDF closets): The BDF closets shall be on the lowest floor level of the building being served. An IDF closet is **required** for each floor above the lowest floor.
 - 2. All BDF/IDF closets shall be designed as shown in the diagram below. Materials for this requirement are shown in the diagram.
 - 3. All data telecommunication rooms must have a 3' door swinging out into the hallway.
 - 4. All data telecommunication rooms are for **INFORMATION TECHNOLOGIES USE ONLY**; any other equipment needing IT service should be located in a separate mechanical room.

2.13 CABLE SUPPORT AND RACK PRODUCTS

- A. All material to be installed to product specifications.
- B. All material to match cable trays installed in the building.
- C. All racking and cable tray to be grounded with # 6 green PVC ground wire.

BDF/IDF REQUIREMENTS (EXAMPLE USING B-LINE AND (SB) HARDWARE)



Item Number	Description of Item	Item Part Number
1	End Bracket Relay Wall Bracket	SB87019S2FB
2	Runway Wall Bracket	FTB12CS
3	90 deg. Splice Bar	90DEGREE KIT
4	Fast Splice Bar	FTSTLC
5	Cable Runway B-Line	FT2X12X10
6	Splice Washer Kit	WASHERSPL KIT
7	Runway Termination Kit	SB-2105-12-TG
8	Copper B-Line Vertical Management	SB57166D084AL
9	Copper B-Line Aluminum Rack	SB556084XUAL
10	Horizontal Management	CMPHH2
11	20 AMP Dedicated Electrical Outlet	

NOTE: Wire management required around each frame: top, bottom and side. This will be sized to fit each building requiring size changes to match density and count of building. All products and fittings are B-Line Cable Tray and fittings.

2.14 CABLE NETWORKS IDENTIFICATION AND LABELING

- A. Each contractor shall permanently mark all cables with permanent labels.
- B. Labels shall be waterproof materials with indelible text information and mechanical attachment or waterproof adhesive.
- C. Each required label location shall contain all fields of required information below.
- D. Required identification information shall include the following items, combined to produce a unique and non-duplicating identification for each cable. No two jacks within the cable plant shall have the same number.
- E. Jacks shall show termination location; floor location and BDF/IDF location (i.e. basement – BDF A001; 1st floor to IDF B101; 2nd floor to IDF C201).
- F. Where multiple cables have the same termination location and floor identification number, the contractor shall add an alpha/numeric suffix to provide non-duplicating identifiers (i.e. A201, A201B).
- G. All jack locations should run straight back to the equipment rooms or cable trays in their own raceway.
- H. Equipment rooms should have a switched light and at least two duplex outlets rated for 20 amps.
- I. Pull strings are to be installed at the time of construction in all conduits.
- J. If utilized, pull strings must be replaced prior to completion of project.
- K. Cables need to be toned and correctly labeled at the time of installation.
- L. Riser fiber cable shall be 12 strand multi-mode and 12 strand single-mode fiber.
- M. Cables for voice and data shall not exceed 290' end to end.

2.15 UNIFORM WIRING PLAN (UWP)

- A. Below are the jacks and symbols to be used by the contractor when cables and terminations are installed. Panduit jacks and equipment will be used. All jacks will be wired as 568A and meet CAT6 certification.



- B. UWP#1s – Consists of three separate cables (23 AWG), 2 blue data and 1 RG6 coax. (See symbol 1 above).
- C. UWP#2s – Consists of two separate cables (23 AWG), 2 blue data, these are the standard for all offices. (See symbol 2 above).
- D. UWP#3s – 1 blue voice cable only (23 AWG). This jack is used for alarm circuits mostly. (See symbol 3 above).
- E. UWP#4s – 1 blue data cable (23 AWG). Used where no phone will ever be needed but data transmission is required. An example would be an in-house billing system, i.e. Harco. (See symbol 4 above).

2.16 VOICE AND DATA CABLE SPECIFICATIONS FOR HORIZONTAL CABLING

- A. Cables will be 23 AWG 8 conductors Unshielded Twisted Pair (UTP).
- B. All cables will be blue category 6 four pair and comply with EIA/TIA 568A standards.

2.17 VIDEO WIRING PLAN (UMP)

- A. The contractor must install F59SSV quad shielded RG 6 type drop cables for subscriber loop locations. RG6 type subscriber drop cables are used to interconnect the TV outlet with multi-tap devices that will be installed at the BDFs or IDFs.
- B. At the outlet, the contractor shall terminate the cable in the outlet connector using an F10F10S11-X straight jack. The TV outlet shall then be terminated using a 75-ohm F terminator.

2.18 VIDEO RISER CABLES

- A. Where video riser cables are required between floor types F11SSEF and single-mode fiber will be installed.
- B. Routing of video riser cables follows voice cable installation from floor to floor.

2.19 WIRELESS NETWORKING REQUIREMENTS

- A. One (1) 1" conduit run to each location for networking cables.
- B. Conduits will terminate either at BDF, IDF or above the cable trays with CAT6 data cable being installed.
- C. All ANSI/TIA and NEC codes or requirements must be met.

2.20 CAMERA INSTALLATION

- A. A 1" conduit from the camera location back to the cable tray or above suspended ceilings.
- B. Conduits will terminate either at BDF, IDF or above the cable trays with blue CAT6 data cable being installed.
- C. A blue CAT6 data cable shall be installed and terminated in an RJ45 Panduit jack.
- D. Jack shall be labeled to show proper BDF or IDF location, i.e. Jack A1001 for BDF or B2001 for IDF.
- E. Cameras to be used are axis 216FD for fixed dome inside installation.
- F. Outside cameras are to be axis and will be listed by their needs. Recommended part # AXIS 223M, Outside Housing recommended part # AXIS #24889, including heater and blowers.
- G. NUV for each building to be installed in BDF rooms equipment rack, part # 1PNUR1UST4TB8R must be able to record for 28 days.

2.21 OUTSIDE EMERGENCY PHONES

- A. Two 1¼" conduits run to pedestal location, 1 for Telecom/fiber cables, and 1 for electrical circuit to be installed with ground fault interruption 20 Amp minimum 120v rated. Each to be terminated in the proper equipment rooms, i.e. electric to electric panel, IT to proper BDF room.
- B. 1¼" conduits need to be rated for outdoor use, PVC schedule 40 recommended.

C. Symbol for location(s) is:



2.22 US:IT VOICE AND DATA CABLE SPECIFICATIONS FOR JACKS

- A. All cables are 23 AWG 8 conductors unshielded twisted pair cable.
- B. Category/Level 6 – cable must be 8 conductor and comply with EIA/TIA 568-A standards.
- C. Color-coded with a blue PVC jacket.
- D. DC Resistance 9.38 @ 100 meters.
- E. DSC Resistance Unbalanced 5% maximum.
- F. Impedance @ 250 MHZ $100 \pm 15\%$.
- G. Category/Level 6 – When requested for installation, specs will be given and approval from Telecommunications on the cable to be installed will be given.
 - 1. Characteristics:
 - a. Propagation Delay @ 10 MHZ 5.7 per/meter.
 - b. Delay Shew @ 25NS/100 meters.
 - c. Attenuation crosstalk 11.4 db @ 250 MHZ.
 - 2. Specifications:
 - a. Blue PVC jacket.
 - b. 8 Conductors 23 gauge.
 - c. DC Resistance 9.38/100 meters.
 - d. DSC Resistance unbalanced 5% maximum.
 - e. Pair to ground capacitance unbalanced maximum @ 1 KHZ 100m.
 - 3. Transmission Properties:
 - a. Freq 427.0.
 - b. Maximum attenuation @ 20 deg. Celsius 50.5.
 - c. Near end crosstalk worst pair combination 64-15log (F/00.772).
 - d. Power Sum N/A.
 - e. Worst Pair SRL 10 db.
 - f. Resistance OHMS 100 $\pm 15\%$.

2.23 INSTALL LEVEL 6 STANDARDS

- A. ANSI/TIA.E1A 568A Category 6 E (400 MHZ):
 - 1. 155 mbps ATM and 100 mpbs Ethernet.
 - 2. 4 pair 23 gauge copper.
 - 3. ISO/IEC 11801.
 - 4. Min Bend Radius .820.
 - 5. PVC Blue Jacketed.
 - 6. Cable markings starting at 0 to 1000' per box.
 - 7. Non Plenum 75N4.
- B. ETL Verified Electrical Performance:
 - 1. CAT6 STANDARDS:
 - a. Input Impedance 100 ohm ± 15 ohm 1-100 MHZ.
 - b. Capacitance 4.6 NF/100 m nominal.
 - c. DE Resistance/Unbalanced 6.66 ohms/100 m max.
 - d. Propagation Delay 5.7 N/SEC/m mac at 10 MHZ.

2.24 TEST RECORDS FOR ISP/OSP

- A. Contractor will test each OSP pair in each cable on an end-to-end basis after terminating. Maximum allowable defective pairs will be limited to 1% of the total number of pairs and a maximum of one (1) pair per 25-pair binder group. Defective pairs over 1% will require cable repair or replacement at the Contractor's expense.
- B. ISP testing for each station cable is required with zero defective pairs acceptable.
- C. The Contractor, at no cost to the University, will replace cables rejected by the US:IT department with new cable from end to end.
- D. Records of testing will be delivered to US:IT in MSExcel format, or software that is compatible with MSExcel.
- E. Building will not be accepted for service prior to records being received, thus no service will be provided.

PART 3 EXECUTION

3.1 OSP – FIBER INSTALLATION

- A. No splices will be allowed in OSP fiber. Any faulty cables must be replaced at Contractor's expense.
- B. All fiber cable must be installed in accordance with manufacturer recommended tensile specifications.
- C. Lubricant must be used when installing fiber cable. This lubricant must be manufacturer guaranteed to be non-destructive to the cable sheath or any portion of the inner duct.
- D. All fiber cables shall be terminated in an approved Lynn patch panel using approved ST, SC or SCAPC connectors. All connections shall be fusion splicing onto correct connectors. Labels shall show the destination of each fiber optic strand.
- E. All fiber cable will be tested for loss and bandwidth according to the manufacturer's specifications. Tests shall be performed after all the cable has been installed, spliced, and terminated.
- F. All fiber cable shall be 62.5/125 multi-mode or hybrid Hitachi/Corning Fiber containing twelve multi-mode fibers and 12 single-mode fiber rated for outside usage in duct system.

3.2 OSP – DATA FIBER INSTALLATIONS

- A. Specifications for Altos/Lst Cables:
 - 1. Maximum attenuation: 3.5/1.0.
 - 2. Minimum bandwidth: 120/500 850 MHZ to 1300 MHZ.
 - 3. Gigabit Ethernet Distance Guarantee 500/1000.
 - 4. Multi-mode/Single-mode.
 - 5. Graded Index: 50 Gigabit Plus CL.
 - 6. 62.5/125 micron core diameter (+/-3).
 - 7. Maximum Tensile Loading: 600 lbf.
- B. The Contractor is responsible for installation and testing of fiber. A loss of more than 2dB is not acceptable.
- C. All fiber cable must be installed in accordance with manufacturer recommended tensile specifications.
- D. All fiber cables shall be terminated in an approved patch panel using SC ceramic ferrule connectors. Single-mode fiber must also be properly terminated and marked using SC/APC or

SC pigtails, both need to be fusion spliced. Labels shall show the destination of each data fiber optic strand.

- E. All fiber must be tested prior to installation with an Optical Time Domain Reflectometer (OTDR) to ensure cable integrity and to identify any damage due to shipping. An OTDR graph must be delivered to the University prior to the installation of the fiber cable and after the cable has been installed.

3.3 DATA FIBER TESTING

- A. All fiber cable must be tested to guarantee the performance integrity of cables, bends, tensile loads, and terminations or cross connects.
- B. Each fiber cable must be tested for loss and bandwidth. Tests shall be performed upon completion of installation and termination.
- C. Any cable that is found to be defective shall be repaired or replaced at the contractor's expense.
- D. An OTDR graph must be provided for each fiber strand tested.
- E. Testing must be accomplished with an OTDR.

3.4 INSIDE PLANT (ISP) INSTALLATION

- A. The cable will be less than 280 feet from station jack to distribution frame termination.
- B. All cable paths that will be used for Category 6 cable installation must meet all applicable codes, BICSI and ANSI/TIA/EIA standards.
- C. When a cable must be created in an existing building, the following concealment methods are acceptable:
 - 1. Dry wall: fishing of hollow wall cavities.
 - 2. Plaster or Tile Wall: Color coordinated wire mold.
 - 3. Drop ceiling: Velcro every 10' and avoid lighting fixtures and all electrical conduit and raceway.
 - 4. Utility Corridors: Concealment not required; Velcro every 10' to (chases and trays) to self-supporting hangers, avoid receptacles and all electrical conduit/raceways. Clear and free conduit or riser sleeves are available for use wherever they are found and should be used first.
 - 5. Raceway shall be installed where indicated and when required to run on the surface of a wall. Raceway shall be Panduit and must be properly sized and meet the installation requirements of the manufacturer of the cable to be installed.

END OF SECTION 27 00 00

SECTION 28 31 00
FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.1 SCOPE

- A. All fire alarm equipment shall be U.L. listed and furnished complete by one U.L. listed supplier. All wiring materials shall comply with the National Electrical Code (NEC), Article 760 and NFPA 72. The equipment and services supplier shall employ NICET Certified Engineers and Technicians.
- B. The Electrical Contractor shall furnish shop drawings of all fire alarm devices, factory wiring diagrams, and fire alarm device locations.
- C. The fire alarm system shall be a complete non-coded, LOCAL, supervised closed circuit, automatic system.
- D. The fire alarm system and all components shall be Gamewell and Wheelock. Model numbers are used only to establish a level of quality.
- E. Equipment needing special tools for modifications and program changes shall not be allowed. Full onsite diagnostics and programming shall be allowable via keypad on main panel.
- F. All equipment and devices submitted must meet UL 864 9th Edition Listing.
- G. Submittals shall include copies of NICET Certifications for Technicians, and UL 864 9th Edition Listing Documents. Submittals without these documents will not be considered.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Fire alarm control panel shall be Gamewell Programmable Panel with Starlink Communication Device. Accessories to include initiating circuit module. Enclosure shall be for surface wall mounting with lock and keys. Include battery operated emergency power supply with capacity for operating system in standby mode for 24 hours.
- B. Manual pull stations shall be Gamewell MS-95.
- C. Smoke detectors shall be:
 - 1. Standard – Gamewell XP95-P.
- D. Automatic heat detectors shall be:
 - 1. Gamewell XP95-T fixed temperature heat sensor.
 - 2. Gamewell XP95-T, 135° fixed temperature heat sensor.
 - 3. Gamewell XP95-T, 135° rate-of-rise heat sensor.

All devices shall be furnished with outlet boxes.

- E. Combination alarm horn/strobe devices shall be:
 - 1. Combination units shall be adjustable for 4 strobe settings – 15, 30, 75 & 110 candela, and two-horn db settings. All strobe devices shall be synchronized.
- F. Strobe devices shall be:
 - 1. Eaton ELSTR adjustable for 4 strobe settings – 15, 30, 75 & 110 candela. All strobe devices shall be synchronized.
- G. Mini horn devices shall be:
 - 1. Eaton ELSTR.
- H. Initiating and Notification Circuit Wiring: Power limited fire-protective signaling cable, copper conductor, 300 volts, insulation rated 105 degrees C.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices as shown on the plans.
- B. All 24 VDC wiring shall not be smaller than #16 AWG. Any wiring exposed or concealed lower than 7 feet from the floor shall be in EMT.

Size and number of wires shall be in accordance with wiring diagrams supplied by the manufacturer.
- C. The Electrical Contractor shall arrange for the factory representative to demonstrate the complete system for the Owner. He shall also notify the Engineer of the test.
- D. The AC service for the fire alarm shall be from a lockable circuit breaker located in the panelboard.
- E. The Electrical Contractor shall, upon completing the installation of the Fire Alarm System, conduct a complete test of the system in the presence of a representative of the Fire Alarm Equipment Manufacturer. During the course of the test, each manual station shall be activated, each smoke detector shall be smoke tested, or an equivalent test performed, each rate of rise heat detector shall be activated by way of applying heat, each fixed temperature heat detector shall be activated by way of removing the fixed temperature heat element or shorting the terminal of the heat detector. The manufacturer shall supply a minimum of one-year guarantee on all new Fire Alarm Equipment.
- F. During testing each supervised circuit, associated with the Fire Alarm System shall be opened at the most remote point in that circuit causing the trouble indication at the control panel to operate, thereby ascertaining that each circuit is supervised as required. At the completion of the test, a letter shall be submitted by the Electrical Contractor to the Owners stipulating that the Fire Alarm system was installed according to these specifications.

SECTION 31 05 00
LOAM, SEEDING AND SODDING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Coordinate work with that of other trades affecting or affected by work of this Section and cooperate with such trades to assure the steady progress of the Work.
- B. All work under this Section shall be performed by workers experienced in lawn installation under the full time supervision of a qualified supervisor. Notify the Engineer of the name and telephone number of the supervisor 48 hours in advance of the first day of lawn construction.
- C. Contractor shall have a thorough knowledge and understanding of the phasing plan prior to beginning work.

1.2. DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials, and equipment necessary to complete the work of this Section, and without limiting the generality thereof includes:
 - 1. Screening, placing, and grading of previously stockpiled topsoil, including the furnishing of additional topsoil for seeding and or sodding areas.
 - 2. Seeding and/or sodding
 - 3. Protecting and maintaining all seeded areas until Final Acceptance.
 - 4. Restoration of existing seeded and planted areas disturbed by the work of this Contract.

1.3 REFERENCE STANDARDS

Where applicable, the latest edition on the "Standard Specifications for Highways and Bridges" including the latest errata as published by the State of Maine, Department of Transportation shall be used as a reference standard. The Standard Specifications shall hereafter be referred to as "SSHB".

1.4 STORAGE OF MATERIAL

- A. Deliver material to the site in original unopened packages, showing weight, manufacturer`s name and guaranteed analysis.
- B. Store materials in such a manner that their effectiveness and usability will not be diminished or destroyed and shall be uniform in composition, dry, unfrozen, and free flowing.

PART 2 - PRODUCTS

2.1 TOPSOIL

- A. All topsoil shall fulfill the requirements for new topsoil. If on-site topsoil does not meet these requirements, it shall be supplemented to meet specifications.
- B. All topsoil shall be screened loam and of good, rich, uniform grade without admixture of subsoil material. It shall be free from hard clods, stones, stumps, roots, or similar substances 1 inch or more in diameter, debris, or other material deleterious to planting operations or plant growth.

- C. Soil analysis shall be provided on a representative sample of soil from each source where topsoil is obtained.
- D. At least three 2-pound samples of stockpiled topsoil shall be submitted by the Contractor to a private testing laboratory approved by the Engineer, for testing and analysis. Each analysis shall be accompanied by the laboratory's recommendations for amending the topsoil if necessary to meet these specifications. Topsoil shall be tested in conformance with the Standards of the Association of Official Agricultural Chemicals. No topsoil shall be used until test results have been received by the Engineer and any and all amendments required have been made.
- E. The following textural classes, as determined on the basis of material passing the 20-mesh sieve and subjected to partial mechanical analysis, will be acceptable:
 - 1. Loamy sand, with not more than 80 percent sand.
 - 2. Sandy loam.
 - 3. Loam.
- F. New topsoil shall contain not less than 10% or more than 20% organic matter in that portion of the sample, which passes a 1/4" sieve when determined by the wet combustion method on a sample dried at 105 degrees Celsius. The pH value on that portion of the sample that passes a 1/4" sieve shall be within a range of 4.5 to 6 for topsoil to be used in planting areas and within a range of 6 to 7 for topsoil to be used in seeding areas.
- G. 100% by weight shall pass a one (1) inch opening sieve and 97%-100% shall pass a 1/4" sieve. In the latter material there shall be not less than 20% or more than 65% passing a 200-mesh sieve as determined by a wash test made in accordance with the standard test ASTM D-1140.

2.2 TOPSOIL ADDITIVES

- A. Commercial Fertilizer shall be a complete fertilizer and shall be a standard product complying with State and United States Fertilizer Laws. Fertilizer shall be delivered to the site in the original unopened containers, which shall bear the manufacturer's name and guaranteed statement of analysis. At least 50% by weight of the nitrogen content of the fertilizer shall be derived from organic materials. Fertilizer for lawn areas shall contain not less than 8% nitrogen, 16% phosphorus, and 8% potash by weight of ingredients or as otherwise indicated by topsoil test results.
- B. Superphosphate shall be a finely ground phosphate rock as commonly used for agricultural purposes and shall contain not less than 18% available phosphoric acid. Use only as directed by testing laboratory.
- C. Ground Limestone shall contain not less than 85% of total carbonates and shall be ground to such fineness that 50% will pass through a 100-mesh sieve and 90% will pass through a 20-mesh sieve. Coarser material will be accepted provided the specified rates of application are increased proportionately based on quantities passing the 100-mesh sieve.
- D. Water shall be furnished by the Construction Manager and shall be suitable for irrigation and free from ingredients harmful to plant life. Hose and other watering equipment required for the work shall be furnished by the Contractor.

2.3 SEED

- A. Seed shall be fresh, clean, new crop seed. Seed may be mixed by an approved method on the site or may be mixed by the dealer. If the seed is mixed on the site, each variety shall be delivered in the original containers which shall bear the dealer's name and guaranteed analysis. If the seed is mixed by the dealer, furnish to the Engineer the dealer's guaranteed statement of the composition of the mixture and the percentage of purity and germination of each variety.

- B. Lawn seed of the following types and mixes, shall be purchased from a recognized distributor and shall be composed of the following varieties which shall be mixed in the proportions and shall test to minimum percentages of purity and germination specified within the tolerances established as the Standards of the U.S. Department of Agriculture:

1. Lawn Mix:

<u>Common Name</u>	<u>%Prop</u>	<u>% Purity</u>	<u>% Germination</u>
Kentucky Bluegrass	30	85	80
Creeping Red Fescue	50	98	85
Annual Rye Grass	20	98	90
Apply at 3 lbs. per 1000 S.F.			

2. Conservation Mix:

<u>Common Name</u>	<u>%Prop.</u>	<u>%Purity</u>	<u>%Germination</u>
Creeping Red Fescue	50	85	80
Kentucky Bluegrass	15	85	80
White Clover	5	85	80
Red Top	2	85	80
Birdsfoot Trefoil			
Var. Empire	3	98	85
Annual Ryegrass	25	85	80
Apply at 3 lbs. per 1000 S.F.			

3. Dormant Seeding for Fall Seeding:

<u>Common Name</u>	<u>Rate (lbs./acre)</u>
Winter Rye	168

2.4 SOD

- A. Sod mixture shall be a locally available bluegrass blend to be approved by the Engineer.
- B. Sod shall be thick, well developed, machine cut strips 3/4 inch thick, from an approved sod plantation. Individual sod pieces shall be cut to a uniform size with square corners. Standard sections shall be strong enough to support their own weight when held vertically. Each piece shall be uniformly moist, and not excessively dry or wet.
- C. Sod shall be harvested, delivered, and installed within a period of 36 hours. Sod not installed within this period must be approved by the Engineer prior to installation.

2.5 MULCH

Straw mulch shall consist of long fibred hay or straw, reasonably free from noxious weeds and other undesirable material. No material shall be used which is so wet, decayed or compacted as to inhibit even and uniform spreading. No chopped hay, grass clippings or other short fibred material shall be used unless directed.

2.6 PROTECTIVE FENCING

All newly seeded areas shall be protected from being disturbed. Where such areas will be subject to construction operations, pedestrian, animal, or vehicular traffic erect and maintain adequate fencing.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBGRADE

- A. After Engineer's acceptance of subgrade work performed under SECTION 02220, do whatever additional grading is necessary to bring the subgrade to a true, smooth slope parallel and except where otherwise indicated, six (6) inches below grade for all areas to receive topsoil. Furnish and install grade stakes on a 50 ft. grid and sufficiently spaced to ensure correct line and grade of subgrade and finished grade. Immediately before placing topsoil, rake or otherwise loosen the surface of the subgrade. In areas that have been severely compacted, as determined by the Engineer, scarify to a depth of twelve inches by approved method. Subgrade shall be inspected and approved by the Engineer before placing of topsoil.
- B. After topsoil has been spread, prepare it carefully by scarifying or harrowing and hand raking as determined by the Engineer. Remove all large stiff clods, brush, roots, stumps, litter and other foreign material and stones over one inch in diameter and dispose of legally off-site. Topsoiled areas shall also be free of smaller stones in excessive quantities as determined by the Engineer. Roll the whole surface with a hand or mechanical roller weighing approximately one hundred pounds per foot of width. During the rolling fill all depressions caused by settlement with additional topsoil and then re-grade and roll until the surface presents a smooth, even, and uniform finish and is up to the required grade.

3.2. TOPSOIL ADDITIVES

- A. Applying Fertilizers: Apply commercial fertilizer and work thoroughly into the topsoil in two applications. The first application shall be within one week before seeding, at the rate of thirty-five pounds per thousand square feet, harrowed into the top two inches of seedbed. The second application shall be as determined by the Engineer.
- B. Applying Superphosphate: Incorporate superphosphate, if required, into the topsoil with the first application of commercial fertilizer at a rate recommended by the testing laboratory.
- C. Applying Ground Limestone: After the topsoil has been spread and graded, and, if recommended as a result of the soil analysis, apply ground limestone at the rate recommended by the testing laboratory.

3.3 SEEDING SEASON

- A. The dates for seeding shall be as follows:
 - 1. Lawn Areas: April 1 to June 1 and Sept. 1 to Sept. 15.
 - 2. Conservation Mixes: April 1 to Sept. 15
 - 3. Dormant Seeding: Sept. 15 to Nov. 1Seeds should not be distributed on top of snow.
- B. Seeding at any time other than within the above season shall be allowed only when ordered by the Engineer or when the Contractor submits a written request for permission to do so and permission is granted. Regardless of time of seeding, Contractor shall be responsible for each seeded area until it is accepted as herein specified.

3.4 SOWING OF SEED

- A. Seeding: Seeding shall consist of soil preparation, seeding, raking, rolling, watering, and otherwise providing all labor and materials necessary to ensure the establishment of acceptable turf.

- B. Sowing of Seed: Immediately before any seed is sown, the ground shall be scarified, harrowed, and raked until the surface is smooth, friable and of uniformly fine texture. No seeding shall be done during windy weather. Sow seed in two directions at right angles to each other. Sow the seed evenly by hand or with approved seeding device in the proportions and at the rate per unit of area heretofore specified. Cover seed with a thin layer of topsoil by light raking or other approved method, roll in both directions with a hand roller weighing approximately one hundred pounds per foot of width, and water with a fine spray. Take necessary precautions to keep the area undisturbed until the grass is established.
- C. Hydro-Seeding: (contractor's option) Seed shall be mixed with lime, fertilizer, and cellulose wood fiber mulch for hydro-seeding in conformance with Section 618.07 of SSHB.
- D. Mulching for hydro-seeded areas shall be wood fiber, and hay mulch for mechanical or hand seeding. All areas should receive a uniform application of mulch of a thickness that would allow germination of seed.

3.5 INSTALLATION OF SOD

- A. Prepare topsoil to receive sod in accordance with methods for seeding contained herein. Prior to sodding, the topsoil shall be uniformly graded and cleared of all trash, debris, and stones larger than 1-inch diameter, and of all roots, brush, wire, and other objects.
- B. After grading is complete irrigate the topsoil bed 12-24 hours prior to sodding to a depth making the topsoil evenly moist. Sod shall not be laid on soil that is powdery dry or excessively moist or slippery.
- C. Lay sod strips perpendicular to slope. Place all rows parallel with joint butted tightly together and staggered. Do not stretch or overlap joints. Peg all areas where slope exceeds 3:1.
- D. Water all sod areas immediately following its installation so that the sod surface and topsoil surface are thoroughly soaked. Cut and maintain established sod in accordance with the requirements for seeding contained herein.

3.6 WATERING

Water newly seeded areas daily or as necessary to maintain moisture to a minimum depth of 4 inches with a fine spray to supplement natural rainfall to the equivalent of 1 inch or 4 inches depth.

3.7 MAINTENANCE

- A. Maintenance shall begin immediately after each portion of lawn is sown and shall continue in accordance with the following requirements:
 - 1. Lawns shall be maintained by the Contractor for at least 30 days for sodding and 60 days for seeding or as much longer as necessary to establish a uniform, thick, well developed stand of the specified grasses, or until substantial completion or until acceptance, whichever is later.
 - 2. Scattered bare spots, none of which are larger than 36 square inches, will be allowed up to a maximum of two percent of any lawn area. After the grass has started, all areas and parts of areas, which fail to show a uniform thick and well developed, stand of grass, for any reason whatsoever, shall be re-seeded or re-sodden repeatedly until all areas are covered with a satisfactory growth. Prior to Acceptance, damage resulting from erosion, gullies, washouts, or other causes shall be repaired by filling with topsoil, tamping, re-fertilizing, and re-seeding or re-sodding. At time of first cutting, mower blades shall be kept not less than 2-1/2 inches high. Continue cutting until acceptance or not to exceed three cuttings.

3. Protection: Seeded areas shall be protected against damage by a fence as specified herein. It shall be maintained in a condition acceptable to the Engineer. This fence and any protective devices remaining on site shall be removed after acceptance of the work of the Contract.

3.8 INSPECTION FOR ACCEPTANCE

Upon written request by the Contractor, the Engineer shall inspect all lawn areas to determine completion of Contract work. This request must be submitted at least ten days prior to the anticipated date. The lawns will become acceptable when they show a uniform, thick, well-developed stand of grass that may be occupied by the Owner for their intended use. When acceptance is made in writing by the Engineer, the Contractor's responsibility for maintenance shall terminate.

3.9 CLEANING UP

After completion of the work, the Contractor shall remove all debris, materials, rubbish, etc., from the site. He shall dispose of them in a manner satisfactory to the Engineer. The premises shall be left clean, presentable, and satisfactory.

SECTION 31 20 00
EARTH MOVING FOR STRUCTURES AND PAVEMENTS

PART 1 – GENERAL

1.1 **RELATED DOCUMENTS**

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

1.2 **SUMMARY**

- A. Section includes performing site preparation, excavation, borrow, filling, backfilling, compaction, compaction testing, and finish grading necessary to construct the finished grades indicated for structures, pavements, and other on-grade slabs or site work. Requirements for excavating and backfilling for utility lines and storm drains are contained in Section 31 21 00, "Earth Moving for Utilities".
- B. Related Sections include the following:
1. Division 01 Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security, and protection facilities procedures.
 2. Division 01 Section "Temporary Tree and Plant Protection" for protecting trees remaining on-site that are affected by site operations.
 3. Division 32 Section "Turf and Grasses, Plants" for finish grading including preparing and placing planting soil mixes and testing of topsoil material.
 4. Division 31 Section "Earth Moving for Utilities" for soil materials, excavating, backfilling.
 5. Division 31 Section "Dewatering" for requirements and guidelines for dewatering procedures.
 6. Division 31 Section "Excavation Support and Protection" for requirements and guidelines for temporary excavation support.

1.3 **REFERENCES**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C136 2006 Sieve Analysis of Fine and Coarse Aggregates

ASTM D698 2007 (Rev. 1) Standard Test Methods for Laboratory
Compaction Characteristics of Soil Using Standard Effort (12 400 ft-
lbf/ft³ (600 kN-m/m³))

ASTM D1557 2007 Standard Test Methods for Laboratory Compaction
Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700
kN-m/m³))

ASTM D1586 2008 (Rev. A) Standard Test Method for Standard Penetration Test
(SPT) and Split-Barrel Sampling of Soils

ASTM D2487 2006 (Rev. 1) Standard Practice for Classification of Soils for
Engineering Purposes (Unified Soil Classification System)

ASTM D2729 2003 Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer

Pipe and Fittings

ASTM D2855	1996 (Rev. 2002) Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D6938	2008 (Rev. A) Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM D3212	2007 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM F402	2005 Standard Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
ASTM F758	1995 (Rev 2007, E1) Standard Specification for Smooth-Wall Poly (Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage

ARMY CORPS OF ENGINEERS (COE)

COE EM-385-1-1 2008 Safety and Health Requirements Manual

State of Maine, Department of Transportation MDOT Standard Specifications, 12/2002 and amendments.

- B. Reference Standard Specifications: Materials and workmanship specified herein with reference to MDOT Maine State Standard shall be in accordance with the referenced articles, sections, and paragraphs of the standard except that contractual and payment provisions do not apply.

1.4 DEFINITIONS

- A. Coarse Aggregate: A layer of clean, poorly graded crushed rock, stone, or gravel having a high porosity which is placed beneath or adjacent to a building slab or structure with or without a vapor barrier to cut off the capillary flow of pore water to the area immediately below or adjacent a slab or structure.
- B. Compaction: The process of mechanically stabilizing a material by increasing its density at a controlled moisture condition. "Degree of Compaction" is expressed as a percentage of the maximum density obtained by the test procedure described in ASTM D698 or ASTM D1557 for general soil types abbreviated in this specification as "**95 percent** ASTM D1557 maximum density".
- C. Structural Fill: Granular fill material constructed to attain maximum bearing strength and minimize consolidation or differential settlement under a load.
- D. Excavation: The removal of soil, rock, or hard material to obtain a specified depth or elevation.
- E. Hard Material: Weathered rock, dense consolidated deposits, or conglomerate materials, (excluding manmade materials such as concrete) which are not included in the definition of "rock," but which usually require the use heavy excavation equipment with ripper teeth or the use of jack hammers for removal. Material indicated in the soil boring logs as having a standard penetration resistance as determined by ASTM D1586 between 60 and 120 blows per foot is arbitrarily defined herein as "Hard Material".
- F. Undisturbed Native Soil: Existing in place soil.

- G. Lift: A layer (or course) of soil placed on top of a previously prepared or placed soil. Lift thickness shall be such that desired density is achieved throughout the lift thickness with 3 to 5 passes of the compaction equipment. Lift thickness shall not exceed 8 inches.
- H. Rock: Solid, homogeneous, interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling and blasting, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punches or rock breakers; also, large boulders, buried masonry, or concrete other than pavement, exceeding three (3) cubic yard in volume. Material indicated in the soil boring logs as having a standard penetration resistance as determined by ASTM D1586 greater than 120 blows per foot is arbitrarily defined herein as "Rock." Removal of "hard material" will not be considered rock excavation because of intermittent drilling and blasting that is performed merely to increase production.
- I. Ledge: Where used in this section, the term "Ledge" and "Rock" shall be considered the same and may be used interchangeably. The definition of "Ledge" shall be the same as "Rock" as defined in this section.
- J. Soil: The unconsolidated surface material of the earth's crust resulting from the chemical and mechanical weathering of rock and organic material.
- K. Subgrade: The material in excavation (cuts) and fills (embankments) immediately below any subbase, base, pavement, or other improvement. Also, as a secondary definition, the level below which work above is referenced.
- L. Granular Fill: A dense, well-graded aggregate mixture of sand-gravel or crushed stone with suitable binder soil, placed on a subgrade to provide a suitable foundation for further construction.
- M. Loam: In natural or undisturbed soil formations, the fine-grained, weathered material on the surface or directly below any loose or partially decomposed organic matter. Loam may be a dark-colored, fine, silty, or sandy material with a high content of well-decomposed organic matter, often containing traces of the parent rock material. Gradation and material requirements specified herein apply to all loam references in this contract. The material shall be representative of productive soils in the vicinity.
- N. Unsatisfactory Material: Existing, in-place soil or other material which can be identified as having insufficient strength characteristics or stability to carry intended loads in fill or embankment without excessive consolidation or loss of stability. Materials classified as PT, OH, or OL by ASTM D2487 are unsatisfactory. Unsatisfactory materials also include poor manmade fills, refuse, frozen material, uncompacted backfills for previous construction, unsound rock, or soil lenses, or other deleterious or objectionable material.
- O. Fine Aggregate: Aggregate passing the 3/8-inch sieve and almost entirely passing the No. 4 sieve and predominantly retained on the No. 200 sieve, as determined by ASTM C125.

1.5 SUBMITTALS

- A. Record of Existing Conditions
- B. Field Test Reports (Note - Reports shall be as specified herein and as per applicable ASTM Standards).
 - 1. All aggregate, granular fill tests/gradation report.
 - 2. Subsurface drains, granular fill tests
 - 3. Structural fill material tests/compaction report.

4. Compaction tests
5. General site fill/gradation report.
6. Stone dust/gradation report
7. As specified within this section.

1.6 DELIVERY AND STORAGE

- A. Deliver and store materials in a manner to prevent contamination or segregation. Store synthetic fiber filter cloth to prevent exposure to direct sunlight in accordance with the manufacturer's written recommendations.

1.7 CRITERIA FOR BIDDING

- A. Base bids on the following criteria (field verify existing conditions):
 1. Surface elevations as indicated. If not indicated, verify in the field.
 2. Pipes or other man-made obstructions, aside from those indicated on the drawings could be encountered. Field verify existing conditions.
 3. The character of the material to be excavated or used for subgrade is as indicated. If not indicated, field verify. Hard material identified as conglomerate clay, sand, silt, or gravel, volcanic tuff, or consolidated calcareous marine sediments on the borings shall not be considered as rock and removal of such material shall not give cause for a claim for additional compensation regardless of hardness or difficulty in removing.
 4. Removal of rock to the lines and grades indicated and required shall be done at the unit price bid (on the bid form) for "Mass or Trench Excavation". The unit price shall include all of the site contractors' costs associated with rock removals including but not limited to: watchmen; signage and advertising, etc., video/preblast surveys and water quality samples of wells within 500-foot radius of the anticipated blasting areas.
 5. Ground water elevations indicated are based on observations at the time subsurface investigations were made and do not necessarily represent ground water elevation at the time of construction.
 6. Borrow material, Suitable backfill and fill material in the quantities required is not available at the project site.
 7. Blasting will be permitted, obtain Engineer/Owner permission. Remove material by drilling and use of expansion jacks for feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers, or as approved by the Engineer.
 8. The unit price for mass or trench rock shall include the entire cost to drill, blast, remove and/or dispose of rock material as required.

1.8 SITE CONDITIONS

- A. Utilities: Contact the Engineer 72 hours prior to construction for the location of all existing underground utilities. Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk. Contact the utility companies for locations of their utilities. Perform work adjacent to privately owned utilities in accordance with procedures outlined by the utility company. Excavation made with power-driven equipment is not permitted within two feet of known utilities or subsurface construction. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured. Support uncovered lines or other existing work as affected by the contract excavation until approval for backfill is granted by the Engineer. Report damage to utility lines or subsurface construction immediately to the utility Owner. Notify the Engineer immediately.

1.9 ADDITIONAL CRITERIA REGARDING ROCK REMOVAL

- A. For concrete slabs and footings for the buildings, the following shall also apply:
1. When ledge is encountered, thoroughly clean off the ledge; contact the Engineer for their inspection of such ledge.
 2. Remove any ledge which is fractured or weathered or otherwise unsuitable (as determined by the Engineer).
 3. If the Engineer determines that the rock is sound, then construct the footings on such sound rock.
 4. Footings shall be installed at the required minimum depth of cover as determined by the Engineer.

1.10 ROCK EXCAVATION

- A. Boulders three (3) cubic yard or smaller shall be considered to be unclassified material regardless of location. Concrete and cut stone encountered in excavation in excess of three (3) cubic yard will be considered as "rock" as herein defined.
- B. The word "trenches" as used herein shall mean excavation for utility lines having vertical sides whose depths exceed their width. Excavations for building foundation walls, retaining walls, and other structures other than utility lines shall not be classified as trench excavation.
- C. When, during the process of excavation, rock is encountered, such material shall be uncovered and exposed and the Engineer shall be notified by the Contractor before proceeding further. The Contractor shall not proceed with the excavation of material claimed as rock until the material has been classified by the Engineer or the Engineer. Failure on the part of the Contractor to uncover such material or notify the Engineer will forfeit the Contractor's right-of-claim for any compensation.
- D. The Contractor shall employ at their expense a registered land surveyor acceptable to the Engineer to take cross sections of rock before removal of same and provide computations of cross sections within the limit of excavation lines. The contractor shall provide this information to the Engineer for review prior to beginning any blasting.
- E. Rock payment lines for building excavation will permit 6 inches of overblow in all directions from footing. Rock payment lines for trenches will permit 6 inches of overblow in all directions from bedding as shown in the Drawings (min. 36" width for payment).
- F. For the purposes of computing compensation, the payment limits for excavation will be not over 18 inches beyond face of foundation wall in any horizontal direction. Excavations which are made beyond these limits shall be so executed at the Contractor's risk without compensation. Payments will not be made for excess excavations caused by methods of operations used by the Contractor. Unauthorized excess excavations shall be at the Contractor's risk and expense.
- G. All rock excavated shall be removed from the site and disposed of by the Contractor.
- H. All lines and grade work not presently established at the site shall be laid out by the Contractor in accordance with the Contract Documents. Establish permanent benchmarks by employment of a registered land surveyor or professional Civil Engineer. Maintain all established bounds and benchmarks and replace any which are destroyed or disturbed.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Coarse Aggregate: Provide clean crushed stone or gravel similar to MDOT 703.02 with the following gradation (design size 3/4"):

Sieve	% by Weight Passing
1 inch	100
3/4 inch	90 – 100
1/2 inch	45 – 80
3/8 inch	20 – 55
1/4 inch	5 – 20
No. 4	0 – 10
No. 8	0 – 5
No. 200	1.5 max.

- B. Gas Permeable Coarse Aggregate: Provide clean crushed stone or gravel per ASTM E1465 Type 2 Medium Aggregate with the following gradation:

Sieve	% by Weight Passing
1 inch	100
3/4 inch	90 – 100
1/2 inch	20 – 55
3/8 inch	0 – 15
No. 4	0 – 5

Note: Void space must be at least 40%

- C. Granular Fill: Provide a dense, graded aggregate meeting requirements stated in Section 70 3.06 Type B, MDOT State Standard and as follows:

Sieve	% by Weight Passing
4 inch	100
3 inch	90-100
½ inch	35-75
1/4 inch	25-60
No. 40	0-30
No. 200	0-5

- D. Granular Base: Similar to MDOT 703.06, Type A, and as follows:

Sieve	% By Weight
2 inch	100
1/2 inch	45-70
1/4 inch	30-55
No. 40	0-20
No. 200	0-5

Granular base shall not contain particles of rock that will not pass a 3-inch square mesh sieve.

E. Granular Subbase: Granular subbase to be as follows:

1. As per MDOT 703.06, Type C Aggregate and as follows:
 - a. The gradation of the part that passes a 3 inch sieve shall meet the following grading requirements:

Sieve	% By Weight
1/4 inch	25-70
No. 40	0-30
No. 200	0-5

Granular subbase to be non-frost susceptible. Granular subbase shall not contain particles of rock that will not pass a 6-inch square mesh sieve.

F. Fine Aggregate: Fine Aggregate to be as follows:

1. As per MDOT 703.01, Fine Aggregate and as follows: Provide aggregate meeting requirements as described below.

Sieve	% By Weight
3/8 inch	100
No. 4	90-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 60	10-30
No. 100	2-10
No. 200	0-5

- G. Soil Materials: Provide materials free from debris, roots, wood, scrap materials, vegetable matter, refuse or frozen material. Maximum particle size permitted is 6-inches unless otherwise indicated on the drawings. Use excavated material from the site for the work indicated when material falls within the requirements specified herein.

- H. Structural Fill: Provide materials classified as "Granular Fill" where indicated. Structural fill may also include "General Site Fill" located a minimum of 18" from foundation walls or adjacent to utilities, or a minimum of 12" away from building slabs, pavements or as indicated on the drawings or specified. System to be as follows:

1. Lifts to be a maximum of 8" thick.
2. Compact each lift to 95% compaction as determined by ASTM D1557.
3. Then add the next lift.

- I. General Site Fill: Provide a soil material from the site or borrow that can be readily compacted to the specified densities and meeting requirements as follows:

Sieve	% By Weight
6 inch	100
1/4 inch	25-90
No. 40	0-50
No. 200	0-20

Materials shall be free of organic material, peat, clay, and other similar soft materials and may include blast ledge material up to 6" in diameter.

J. Loam: Loam shall be as covered in Section 31 05 00.

K. Stone Dust: Stone dust shall consist of clean, washed concrete sand or stone dust free from vegetable matter lumps or balls of clay and other deleterious substances conforming to the following gradation requirements:

Sieve Size	%
3/8"	100
No. 4	90-96
No. 100	10-30

NOTE: Do not use mason sand or Limestone screenings.

L. French Drain Stone: Stone for French drains shall be hard durable rock or blasted ledge pieces to be as follows:

1. As per MDOT 703.24, Stone for French Drains and as follows:
 - a. The gradation of the entire sample shall meet the following gradation requirements:

Sieve	% By Weight
6 inch	90-100
1-1/2 inch	0-40
No. 4	0-5

Gradation tests shall conform to AASHTO T27 except that the total sample shall be sieved, and the minimum weight of the sample will be 120lbs.

M. Crushed Stone: Crushed Stone shall be obtained from uniform and durable rock and shall consist of clean, angular fragments of quarried rock, free of objectionable matter and to be as follows:

1. As per MDOT 703.31, Crushed Stone and as follows:
 - a. The stone, which is similar to railroad ballast, shall meet the following gradation requirements in the entire sample taken from the stockpile at the source:

Sieve	% By Weight
2-1/2 inch	100
2 inch	90-100
1 inch	0-30
3/4	0-5

N. No. 2 Stone: No. 2 Stone shall be uniform and durable rock and shall consist of clean, angular fragments of quarried rock, free of objectionable matter including rounded stone and to be as follows:

1. As per ASTM No.2 material and as follows:
 - a. The gradation of the entire sample shall meet the following gradation requirements:

Sieve	% By Weight
3 inch	100
2-1/2 inch	90-100
2 inch	35-70
1-1/2 inch	0-15
3/4	0-5

- O. No. 57 Stone: No. 57 Stone shall be uniform and durable rock and shall consist of clean, angular fragments of quarried rock, free of objectionable matter including rounded stone and to be as follows:

1. As per ASTM No.57 material and as follows:

- a. The gradation of the entire sample shall meet the following gradation requirements:

Sieve	% By Weight
1-1/2 inch	100
1 inch	95-100
1/2 inch	25-60
No. 4	0-10
No. 8	0-5

- P. River Rock: River rock shall be durable rounded rock and shall be clean and free of objectionable matter and debris and shall be as follows:

1. River Rock shall be a rounded “rip-rap like” material and as follows:

- a. Rock: fragments sufficiently durable to ensure permanence in the structure and the environment in which it is to be used. Rock fragments shall be free from cracks, seams, and other defects that would increase the risk of deterioration from natural causes. The size of the fragments shall be such that no individual fragment exceeds a weight of 150 pounds and that no more than 10 percent of the mixture, by weight, consists of fragments weighing 2 pounds or less each. Specific gravity of the rock shall be a minimum of 2.50. The inclusion of more than trace 1% quantities of dirt, sand, clay, and rock fines will not be permitted.
- b. Filter fabric and bedding shall conform as indicated or as described for regular angular rip rap included specification section 31 21 00 “Earth Moving for Utilities”.

2.2 GEOTEXTILE FABRICS

- A. As specified on drawings or in Section 31 30 00, "Sedimentation and Erosion Control Measures"

1. Fabric: woven polypropylene separation geotextile, possessing the following characteristics:

Mechanical Properties	Test Method	Unit	Minimum Average Roll	
			MD	CD
Grab Tensile Strength	ASTM D 4632	N (lbs)	1402 (315)	1402 (315)
Grab Tensile Elongation	ASTM D 4632	%	12	
Trapezoid Tear Strength	ASTM D 4533	N (lbs)	503 (113)	503 (113)
CBR Puncture Strength	ASTM D 6241	N (lbs)	4005 (900)	
Apparent Opening Size (AOS) *	ASTM D 4751	mm (U.S. Sieve)	0.43 (40)	
Permittivity	ASTM D 4491	sec ⁻¹	0.05	
Flow Rate	ASTM D 4491	l/min/m ² (gal/min/ft ²)	163 (4.0)	
UV Resistance (at 500 hours)	ASTM D 4355	% strength retained	70	

* ASTM D 4751, AOS is a Maximum Opening Diameter Value

Physical Properties	Test Method	Unit	Typical Value
Weight	ASTM D 5261	g/m ² (oz/yd ²)	203 (6.0)
Thickness	ASTM D 5199	mm (mils)	0.6 (25)

Roll Dimensions (width x length)	--	m (ft)	3.8 x 110 (12.5 x 360)	5.3 x 78.7 (17.5 x 258)
Roll Area	--	m ² (yd ²)	418 (500)	418 (500)
Estimated Roll Weight	--	kg (lb)	109 (240)	109 (240)

2. Acceptable products: Mirafi 600X or approved equal.

PART 3 – EXECUTION

3.1 PROTECTION

- A. Shoring and Sheeting: Provide shoring bracing, underpinning, and sheeting where required. In addition to Section XXIII A and B of COE EM-385-1-1, and other requirements of this contract meet the following:
 1. Prevent undermining of pavements, foundations, and slabs.
 2. Slope banks where space permits.
 3. Where shoring and sheeting materials remain in place in completed work to prevent settlements or damage to adjacent structures or as directed, backfill the excavation to 3-feet below the finished grade and remove the remaining exposed portion of the shoring before completing the backfill.
- B. Dewatering: Dispose of surface water, which may accumulate in open excavations, unfinished fills, or other low areas. Remove water by trenching where approved, pumping, or other methods to prevent softening of exposed surfaces. Surface dewatering plan shall include rerouting of any storm water runoff or natural drainage if necessary and shall comply with environmental requirements. Collect and dispose of surface and subsurface water encountered in the course of construction.
- C. Water Removal: Remove water by pumping or other methods to prevent the softening of surfaces exposed by excavation. Before excavating below ground water level, place the dewatering system into operation. Lower the water levels at least one foot below the bottom and side slopes of the excavation. Relieve the hydrostatic pressure in pervious zones below the subgrade elevation in layered soils in order to prevent uplift. Use screens and gravel packs as necessary on the dewatering devices to prevent the removal of fines from the soil.
- D. Operation and Performance: Operate the dewatering system continuously, 24-hours per day, and 7-days per week until construction work below existing water levels is complete. Measure and record the performance of the dewatering system at the same time each day by use of observation wells and piezometers installed in conjunction with the dewatering system. After placement of initial slabs and backfill, the water level may be allowed to rise but at no time allow it to rise higher than one foot below the prevailing level of excavation or backfill. Have a back-up pump and system available for immediate use.
- E. Protection and Restoration of Surfaces: Protect newly graded areas from traffic, erosion, and settlements. Repair and reestablish damaged or eroded slopes, elevations or grades and restore surface construction prior to acceptance. Protect existing streams, ditches and storm drain inlets from water- borne soil by means of straw bale dikes, filter fabric dams as indicated on the drawings or as required for good construction practices and to meet all environmental regulations.
 1. Disposal of Excavated Material: Dispose of excavated material in such a manner that it will not obstruct the flow of runoff, streams, endanger a partly finished structure, impair the efficiency or appearance of facilities, or be detrimental to the completed work.
 2. Disposal of Rock. Remove all excess rock off-site.

3.2 SURFACE PREPARATION

- A. Erosion Control: Perform as specified in Section 31 30 00, "Erosion and Sedimentation Control Measures".
- B. Stockpiling Loam: Strip approved loam to a depth of 4 to 6-inches from the site where excavation or grading is indicated and stockpile separately from other excavated material. Stockpiled loam shall be the Contractor's property. Locate loam so that the material can be used readily for the finished grading. Protect and store in segregated piles until needed.
- C. Unsatisfactory Material: Remove organic matter, sod, muck, rubbish, and unsuitable soils under embankments, which are less than 3-feet in thickness and under pavements or slabs on grade. Typical depth of removal of such unsuitable material shall be 18 inches unless otherwise indicated.
- D. Subgrade Proof Rolling: Proof rolling of subgrade soils shall be done only as noted on project drawings and with authorization of the Engineer. Proof rolling shall be done in the presence of the Engineer. Perform proof rolling only when weather conditions permit. Do not proof roll wet or saturated subgrades. Wet or saturated materials degraded by unauthorized proof rolling shall be replaced by the Contractor as directed by the Engineer at no cost to the Owner. Notify the Engineer 2-days prior to proof rolling.

3.3 EXCAVATION

- A. Excavate to the contours and dimensions indicated. Keep excavations free from water while construction is in progress. Notify the Engineer immediately in writing in the event that it becomes necessary to remove rock, hard material, or other material defined as unsatisfactory to a depth greater than indicated and an adjustment in contract price will be considered in accordance with the General Conditions. Refill excavations cut below the depths indicated with granular fill and compact as specified herein. Excavate soil disturbed or weakened by the construction operations or soils soften from exposure to weather. Refill with granular fill and compact as specified herein.
- B. Excavations for Structures and Spread Footings: Excavate to depth indicated on the drawings. If excavation is deeper than indicated on the drawings, then fill with concrete when the foundations or footings are placed or fill with structural fill prior to form placement.

3.4 BORROW MATERIALS

- A. Select borrow materials to meet requirements and conditions of the particular fill or backfill materials to be used. Obtain borrow materials from sources off Owner property.

3.5 FILLING AND BACKFILLING

- A. Subgrade Preparation: Step, bench, or break up sloped surfaces steeper than one vertical to 4-horizontal so that the fill material will bond with or be securely keyed to the existing material. Compact with equipment well suited to the soil being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used.
- B. Fill and Backfill Beside Structures: Place required backfill material adjacent to structures and compact in a manner that prevents wedging action or eccentric loading upon or against the structures. Step or serrat slopes bounding or within areas to be backfilled to prevent sliding of the fill. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Do not place material on surfaces that are muddy, frozen, or contain frost. Do not use equipment for

backfilling operations or for the formation of embankments against structures that will overload the structure. Backfilling against concrete will be done only after the concrete has attained at least 70% of its 28-day compressive strength and approval has been obtained from the Engineer.

- C. Structural Fill: Place structural fill under spread footing, concrete slabs not pile supported, and pavements in loose lifts of 9-inches maximum. Do not place material on surfaces that are muddy, frozen, or contain frost. Compact with equipment well suited to the soil being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Compact each lift as specified herein before placing the overlaying lift. Compaction shall be accomplished continuously over the entire area. Sufficient passes shall be made to ensure that specified density is obtained.
- D. General Site Fill: Construct site fill, at the locations and to lines and grades indicated on the drawings. Use only approved materials in constructing fill upon the prepared subgrade. Place satisfactory material in horizontal lifts not exceeding 18-inches in loose depth. Do not place material on surfaces that are muddy, frozen, or contain frost. Compact with equipment well suited to the soil being compacted. Moisten or aerate material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. Compact each lift as specified before placing the overlaying lift.
- E. Final Backfill for Utilities: Construct backfill (final backfill), and general site fill for storm drains, manholes, utility lines, and other utility appurtenances using the material and compaction requirements specified herein for the adjacent or overlaying work. Bedding and initial backfill requirements are specified in Section 31 21 00, "Earthwork for Utilities". Backfilling against concrete shall be done only after the concrete has attained at least 70% of its 28-day compressive strength and approval has been obtained from the Engineer.
- F. Fill for Coarse Aggregate Under Slab: Place material over compacted subgrade. Compact and test the material. Then install the vapor barrier. Then install, compact, and test the upper layer of material.
- G. Weather Limitations: Fill and backfill shall not be constructed when weather conditions detrimentally affect the quality of the finished course. Place fill and backfill only if the atmospheric temperature is above freezing in the shade and is rising. Do not construct fill and backfill in the rain or on saturated subgrades. If weather conditions are windy, hot, or arid, with high rate of evaporation, schedule the placement in cooler portions of the day and furnish equipment to add moisture to the fill or backfill during and after placement.

3.6 SUBGRADE GEOTEXTILE FABRIC (For Sloped/Flat Surfaces)

- A. Place synthetic fiber geotextile fabric as indicated on drawings and as specified directly on prepared subgrade free of vegetation, stumps, and rocks larger than 2-inches diameter and other debris, which may puncture or otherwise damage the fabric. Repair damaged fabric by placing an additional layer of fabric to cover the damaged area a minimum of Two (2)-feet overlap in all directions. Overlap fabric at joints a minimum of two feet. Obtain approval of geotextile fabric installation before placing fill or backfill. Place fill or backfill on fabric in the direction of overlaps and compact as specified herein. Follow manufacturers recommended installation procedures.

3.7 COMPACTION

- A. Compact each layer or lift of material specified so that the in-place density tested is not less than the percentage of maximum density specified. General fill below grassed areas shall be compacted to at least 90% of its maximum dry density as determined by ASTM D1557.

Fill materials for all other areas shall be compacted to at least 95% of ASTM D1557 unless otherwise noted.

3.8 RESTORATION

- A. Site Grading: Grade to finished grades indicated within 0.10-foot. Grade areas to drain water away from structures. Existing grades, which are to remain but are disturbed by the Contractor's operations shall be restored as directed by the Engineer.
- B. Finishing Subgrades Under Structures and Pavements: Finish the surface of top lift of fill or top of subgrade to the elevation and cross section indicated on the drawings. Finished surface shall be smooth and of uniform texture. Lightly scarify or blade the finished surface to bring the finished surface to within 0.05-foot of the indicated grade and to eliminate imprints made by compaction and shaping equipment. Surface shall show no deviations in excess of 3/8-inch when tested with a 10-foot straightedge.
- C. Disposition of Surplus Material: Surplus or other soil material not required or suitable for filling, backfilling, or embankment shall be removed from Owner's property. Comply with the requirements of applicable environmental requirements.
- D. Protection of Surfaces: Protect newly graded areas from traffic, erosion, and settlements that may occur in compliance with all applicable environmental regulations and as specified in the paragraph entitled "Protection and Restoration of Surfaces". Repair or reestablish damaged grades, elevations, or slopes prior to acceptance of work.

3.9 FIELD QUALITY CONTROL

- A. All testing shall be performed by a qualified Independent Testing Laboratory acceptable to the Engineer and General Contractor at the Owner's expense unless otherwise indicated (see Section 01 40 00 - Quality Requirements).
- B. In addition to the above tests, the Independent Testing Laboratory will perform additional density tests at locations and times requested by the Engineer.
- C. Additional density testing will be required by the Engineer if the Engineer is not satisfied with the apparent results of the Site Contractor's compaction operation.
 - 1. If the test results fail to meet the requirements of these specifications, the General Contractor shall undertake whatever action is necessary, at no additional cost to the Owner, to obtain the required compaction. The cost of retesting will be paid by General Contractor.
 - 2. If the test results pass and meet the requirements of these Specifications, the cost of the initial testing service will be borne by the Owner, but no additional cost will be considered for delays in the performance of the work.
- D. Tests: Test fill, granular base, backfill, granular subbase, granular fill and coarse aggregate as specified herein and as follows:
 - 1. For gradation (sieve analysis) fine and course, as per ASTM C136 and D422.
 - 2. For moisture density as per ASTM D1557. Also perform tests as per Table IV.
For areas under slab on grade: First, nuclear density test the granular fill material under the vapor barrier as per ASTM D6938. Then density test the granular fill which is installed between the slab and the vapor barrier.

TABLE IV TESTS

Material Type	Location of Material	Minimum Field Density Test Frequency
Fills and Backfills	Structures (adjacent to)	One test per side of structure per lift.
Controlled Fills	Primary roadways and structures	One test per lift per 2,000 sq. ft.
Embankments of Borrow	Any	One test per lift per 10,000 sq. ft.
Borrow	Any	One test per lift per 10,000 sq. ft.

3. If the gradation test results fail to meet the requirements of the specifications, or if the sample is noticeably different when delivered to the site, or if the stockpile source changes either before or during construction, or if compaction of the material is unable to meet the compaction requirements, the General Contractor shall undertake whatever action is necessary, at no additional cost to the Owner, to obtain the required gradation. The cost of the retesting will be paid by the General Contractor.
 - a. Additionally the contractor reserves the right to test the material for proper gradation in advance of the project's notice to proceed, however the owner reserves the right to request the material be retested once the materials has arrived on site, especially including but not limited to if one of the following has occurred; more than 3 months have passed since the initial material testing had been done, if the material arriving on site for placement appears to not meet spec, if the supplier stockpile has been reworked or if the stockpile supplier has changed, or if mixing of on-site stockpiles has occurred, or other similar occurrences which may affect the products integrity or as noted above. The contractor incurs the cost of this additional testing.
- E. Structural Fill: Method of in-place density tests shall be in accordance with paragraph "Tests". Acceptance of the compacted material shall be determined in each location by the results of a minimum of two consecutive tests. The average of two tests shall equal or exceed the specified density. The location of the tests for each compacted layer will be randomly selected by the Engineer.
 1. Acceptance: The average of field density test results in each fill area shall meet or exceed the specified density requirements and no individual test shall be more than 3% below specified density.

SECTION 31 23 00.1
EXCAVATING, FILLING AND GRADING

PART 1 - GENERAL

1.1 SCOPE

Excavating, filling, and grading under this Section includes, but is not necessarily limited to:

- Staking and layout.
- Excavating for footings and foundations.
- Filling and backfilling to attain indicated grades.
- Trenching and trench backfilling.
- Sheeting, shoring, and bracing.
- Rough grading of site.
- Excess water control.
- Furnishing and installing gravel fill under interior concrete slabs on grade.
- Rock removal.

1.2 JOB CONDITIONS

- A. Dust Control: Use all means necessary to control dust on and near the work and all off-site borrow areas if such dust is caused by work of this Section or results from the condition in which the Contractor leaves the site. Thoroughly moisten surfaces as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other work on the site.
- B. Protection: Use all means necessary to protect all materials of this Section before, during, and after installation, and to protect objects designated to remain. In the event of damage, immediately make all repairs and replacements at no additional cost to the Owner to the approval of the Engineer.
- C. The locations of existing underground utilities are assumed and have not been independently verified by the Owner or its representative. The Contractor shall determine the exact location of all utilities before commencing work and agrees to be fully responsible for any and all damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Fill - General: Fill material shall be subject to the Engineer approval. Notify the Engineer at least 4 working days in advance of intention to import fill material, designate the proposed borrow area, and permit the Engineer to sample from the borrow area for the purpose of making acceptance tests to prove the quality of the material.
- B. On-site fill material shall consist of soil or soil-rock mixture that is free from organic matter and other deleterious substance, and contains no rocks or lumps larger than 4". Not more than 15% of the rocks/lumps shall be greater than 2-1/2" in greatest dimension.
- C. Imported fill material shall meet the requirements of B. above and further, shall be predominantly granular, with a maximum particle size of 2" and a plasticity index of 12 or less.

D. Aggregate for Base and Subbase

1. Aggregate for base, Type A and B shall be crushed ledge or crushed gravel of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of the part that passes a 3-inch sieve shall meet the grading requirements of the following table:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves	
	Type A	Type B
½ inch	45-70	35-75
¼ inch	30-55	25-60
No. 40	0-20	0-25
No. 200	0-6.0	0-6.0

At least 50 percent by weight of the material retained on the No. 4 sieve shall have at least one fractured face as tested by AASHTO T 335.

Type A aggregate for base shall only contain particles of rock that will pass the 2-inch square mesh sieve.

Type B aggregate for base shall only contain particles of rock that will pass the 4-inch square mesh sieve.

2. Aggregate for base, Type C shall be crushed ledge or crushed gravel of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. The material shall meet the grading requirements of the following table:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
	Type C
4 inches	100
3 inches	90-100
2 inches	75-100
1 inch	50-80
½ inch	30-60
No. 4	15-40
No. 200	0-6.0

At least 50 percent by weight of the material coarser than the No. 4 sieve shall have at least one fractured face as tested by AASHTO T 335.

3. Aggregate for subbase shall be sand or gravel of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. The gradation of the part that passes a 3-inch sieve shall meet the grading requirements of the following table:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves	
	Type D	Type E

½ in	35-80	
¼ inch	25-65	25-100
No. 40	0-30	0-50
No. 200	0-7.0	0-7.0

Type D aggregate for subbase gravel may contain up to 50 percent by weight Recycled Concrete Aggregate (RCA). When RCA is used, the portion of the resulting blend of gravel and RCA retained on a ½” square mesh sieve shall contain a total of no more than 5 percent by weight of other recycled materials such as brick, concrete masonry block, or asphalt pavement as determined by visual inspection.

RCA shall be substantially free of wood, metal, plaster, and gypsum board as defined in Section 7.4 of AASHTO M 319. RCA shall also be free of all substances that fall under the category of solid waste or hazardous materials.

Aggregate for subbase shall not contain particles of rock which will not pass the 4-inch square mesh sieve.

- E. Aggregates for HMA Pavements Coarse aggregate and fine aggregate for hot mix asphalt pavements shall be of such gradation that when combined in the proper proportions, including filler, if required, the resultant blend will meet the composition of mixture for the type of pavement specified.

Coarse aggregate, that material retained on the No. 4 sieve, shall be crushed stone or crushed gravel and, unless otherwise stipulated, shall consist of clean, tough, durable fragments free from an excess of soft or disintegrated pieces and free from stone coated with dirt or other objectionable matter. Coarse aggregate shall not exceed an absorption of 2.0 percent by weight as determined by AASHTO T 85.

Fine aggregate, material that passes the No. 4 sieve, shall consist of natural sand, manufactured sand, or a combination of these. It shall consist of hard, tough grains, free from injurious amounts of clay, loam, or other deleterious substances. Fine aggregate shall not exceed an absorption of 2.3 percent by weight as determined by AASHTO T 84.

The composite blend, minus any reclaimed asphalt pavement used (RAP), shall have a Micro-Deval value of 18.0 percent or less as determined by AASHTO T 327. In the event the material exceeds the Micro-Deval limit, a Washington Degradation test shall be performed. The material shall be acceptable if it has a value of 30 or more as determined by Washington State DOT Test Method T 113, Method of Test for Determination of Degradation Value (January 2009 version) except that the reported degradation value will be the result of testing a single composite specimen from that portion of the sample that passes the ½ inch sieve and is retained on the No. 10 sieve, minus any reclaimed asphalt pavement used.

ASTM D 5821 - 85/80 denotes that 85 percent of the coarse aggregate has one fractured face and 80 percent has two fractured faces.

AASHTO T 304 - Criteria are presented as percent air voids in loosely compacted fine aggregate, (U).

ASTM D 4791 - Criteria are presented as maximum percent by weight of flat and elongated particles (5:1 ratio).

The entire HMA wearing course shall come from the same source of material and the same job mix formula, except when permission is obtained from the Resident to change sources.

- F. 703.08 Recycled Asphalt Pavement: Recycled asphalt pavement shall consist of salvaged

asphalt materials from milled pavements or production waste that has been processed before use to meet the requirements of the job mix formula. It shall be free of winter sand, granular fill, construction debris, or other materials not generally considered asphalt pavement.

- G. 703.081 RAP for Asphalt Pavement: Recycled Asphalt Pavement (RAP) may be introduced into hot-mix asphalt pavement at percentages approved according to the MaineDOT Policies and Procedures for HMA Sampling and Testing. If approved, the Contractor shall provide documentation stating the source, test results for average residual asphalt content, and stockpile gradations showing RAP materials have been sized to meet the maximum aggregate size requirements of each mix designation.

The maximum allowable percent of RAP shall be determined by the asphalt content, the percent passing the 0.075 mm sieve, and Coarse Micro-Deval loss values. The numerical average of the percent passing the 0.075 mm sieve values will be used for the approval. The maximum percentage of RAP allowable shall be the lowest percentage as determined according to 703.081 - Table 4.

- H. 703.09 HMA Mixture Composition: The coarse and fine aggregate shall meet the requirements of Section 703.07. The several aggregate fractions for mixtures shall be sized, graded, and combined in such proportions that the resulting composite blends, including RAP aggregate will meet the grading requirements.
- I. 703.10 Aggregate for Untreated Surface Course and Leveling Course: Aggregate for untreated surface course and leveling course shall be screened or crushed gravel consisting of hard durable particles which are free from vegetable matter, lumps or balls of clay and other deleterious substances. If this item is to be used underneath pavement, it must have a Micro-Deval value of 20.0 or less as determined by AASHTO T 327. If the Micro-Deval value exceeds 20.0, the material may be used if it does not exceed 25 percent loss on AASHTO T96, Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine. The aggregate shall meet the grading requirements of the following table:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves	
	Untreated Aggregate Surface Course	
	Type A	Type B
1 inch	95-100	95-100
¾ inch	90-100	90-100
No. 4	40-65	10-45
No. 10	10-45	10-35
No. 200	0-7.0	0-6.0

- J. 703.11 Aggregate for Shoulder: The gradation of that portion passing a 3-inch sieve shall meet the gradation requirements of the following table:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves		
	*Paved or Unpaved Lifts 4 inches or Greater	Paved Lifts < 4 inches	Unpaved Lifts < 4 inches
1 inch	-	90-100	90-100
¾ inch	25-70	25-100	25-70

No. 40	5-30	5-50	5-30
No. 200	2.0-10.0	2.0-10.0	2.0-10.0

*Shall not contain particles larger than 6 inches or the thickness of the lift being placed, whichever is less.

- K. 703.12 Aggregate for Crushed Stone Surface: Crushed stone surface shall be of quarried stone and have a Micro-Deval value of 18.0 percent or less as determined by AASHTO T327. The aggregate shall meet the grading requirements of the following table:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
1 inch	100
$\frac{3}{4}$ inch	60-90
$\frac{1}{2}$ inch	10-35
$\frac{3}{8}$ inch	2-15
No. 4	0-5

- L. 703.13 Crushed Stone $\frac{3}{4}$ -Inch: Aggregate for Crushed Stone $\frac{3}{4}$ -inch shall be of quarried stone and have a Micro-Deval value of 18.0 percent or less as determined by AASHTO T 327. The aggregate shall meet the grading requirements of the following table:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
1 inch	100
$\frac{3}{4}$ inch	90-100
$\frac{1}{2}$ inch	20-55
$\frac{3}{8}$ inch	0-15
No. 4	0-5

- M. 703.15 Filler: These materials shall conform to the following specification requirements for the designated materials.

Mineral filler shall conform to the requirements of AASHTO M 17.

- N. 703.18 Common Borrow: Common borrow shall consist of earth, suitable for embankment construction. It shall be free from frozen material, perishable rubbish, peat, and other unsuitable material including material currently or previously contaminated by chemical, radiological, or biological agents unless the material is from a DOT project and authorized by DEP for use.

The moisture content shall be sufficient to provide the required compaction and stable embankment. In no case shall the moisture content exceed 4 percent above optimum, which shall be determined in accordance with AASHTO T 180, Method C or D.

- O. 703.19 Granular Borrow: Granular borrow shall consist of sand or gravel of hard durable particles free from vegetable matter, lumps or balls of clay, frozen material, and other deleterious substances. The gradation of that portion passing a 3- inch sieve shall meet the gradation requirements of the following table:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves	
	Material for Underwater Backfill	Material for Embankment Construction
3 inch	100	
No. 40	0-70	0-70
No. 200	0-7.0	0-20.0

Granular borrow shall contain no particles or fragments with a maximum dimension in excess of the compacted thickness of the layer being placed.

- P. 703.20 Gravel Borrow: Gravel borrow shall consist of well-graded granular material having no rocks with a maximum dimension of over 6 inches. The gradation of that portion passing a 3- i nch sieve shall meet the gradation requirements of the following table:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
¼ inch	0-70
No. 200	0-10.0

- Q. 703.22 Underdrain Backfill Material: Material for underdrain shall be free from organic matter, frozen material and shall conform to the following tables:

Type B material shall conform to the following table:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
1 inch	95-100
½ inch	75-100
No. 4	50-100
No. 20	15-80
No. 50	0-15
No. 200	0-5.0

Type C material shall conform to the following table:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
1 inch	100
¾ inch	90-100
⅜ inch	0-75
No. 4	0-25
No. 10	0-5

- R. 703.24 Stone for French Drains: Stones for French drains shall consist of hard, durable rock and shall conform to the following table:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
6 inch	90-100
1½ inch	0-40
No. 4	0-5

- S. 703.25 Stone Fill: Stones for stone fill shall consist of hard, sound, durable rock that will not disintegrate by exposure to water or weather. Stone for stone fill shall be angular and rough. Rounded, subrounded, or long thin stones will not be allowed. Stone for stone fill may be obtained from quarries or by screening oversized rock from earth borrow pits. The maximum allowable length to thickness ratio will be 3:1, The minimum stone size (10 lbs) shall have an average dimension of 5 inches. The maximum stone size (500 lbs) shall have a maximum dimension of approximately 36 inches. Larger stones may be used if approved by the Resident.

Fifty percent of the stones by volume shall have an average dimension greater than 12 inches (200 lbs).

- T. 703.26 Plain and Hand Laid Riprap: Stone for riprap shall consist of hard, sound durable rock that will not disintegrate by exposure to water or weather. Stone for riprap shall be angular and rough. Rounded, subrounded or long thin stones will not be allowed. The maximum allowable length to width ratio will be 3:1. Stone for riprap may be obtained from quarries or by screening oversized rock from earth borrow pits. The minimum stone size (10 lbs) shall have an average dimension of 5 inches. The maximum stone size (200 lbs) shall have an average dimension of approximately 12 inches. Larger stones may be used if approved by the Resident. Fifty percent of the stones by volume shall have an average dimension greater than 9 inches (50 lbs).
- U. 703.27 Stone Blanket: Stones for stone blanket shall consist of sound durable rock that will not disintegrate by exposure to water or weather. Stone for stone blanket shall be angular and rough. Rounded or subrounded stones will not be allowed. Stones may be obtained from quarries or by screening oversized rock from earth borrow pits. The minimum stone size (300 lbs) shall have minimum dimension of 14 inches, and the maximum stone size (3000 lbs) shall have a maximum dimension of approximately 66 inches. Fifty percent of the stones by volume shall have average dimension greater than 24 inches (1000 lbs).
- V. 703.28 Heavy Riprap: Stone for heavy riprap shall consist of hard, sound, durable rock that will not disintegrate by exposure to water or weather. Stone for heavy riprap shall be angular and rough. Rounded, subrounded, or thin, flat stones will not be allowed. The maximum allowable length to width ratio will be 3:1. Stone for heavy riprap may be obtained from quarries or by screening oversized rock from earth borrow pits. The minimum stone size (500 lbs) shall have minimum dimension of 15 inches, and at least fifty percent of the stones by volume shall have an average dimension greater than 24 inches (1000 lbs).
- W. 703.29 Stone Ditch Protection: Rock used for ditch protection shall consist of sound, durable rock that will not disintegrate by exposure to water or weather. Fieldstone, rough quarry stone, blasted ledge rock or tailings may be used. The rock shall be graded within the following limits or as otherwise approved.

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
12 inch	90-100
4 inch	0-15

The size of any stone shall not exceed 18 inches when measured along its longest axis.

- X. 703.31 Crushed Stone: 2-Inch Crushed stone shall be obtained from rock of uniform quality and shall consist of clean, angular fragments of quarried rock, free from soft disintegrated pieces or other objectionable matter.

The stone, which shall be similar to railroad ballast, shall meet the following gradation requirements:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
2½ inch	100
2 inch	95-100
1 inch	0-30
¾ inch	0-5

- Y. Geotextile Fabric:

1. Structural Applications - Geotextile fabric shall be a high modulus, woven geotextile fabric equal to: MIRAFI 500 as distributed by W.H. Shurtleff Company.
2. Separation Applications - such as wrapped stone - non woven equal to Mirafi 160N.

PART 3 - EXECUTION

3.1 GENERAL

- A. Familiarization: Become thoroughly familiar with the site, the site conditions, and all portions of work required by this Section before proceeding.
- B. Backfilling prior to approvals: Do not allow or cause any previous work installed to be covered up or enclosed by work of this Section until completion of required inspections, tests, and approvals; otherwise, all such work shall be uncovered at no additional cost to the Owner. Following testing, inspection, and approval, repair and replace work as necessary to restore it to the condition in which it was found at the time of uncovering, all at no additional cost to the Owner.
- C. Utilities: When necessary to connect a utility to a main in a public way, all requirements of both the authorities governing the utility and the public way shall be met. As directed by these authorities, replace pavement at no additional cost to the Owner. All permits, fees, and other costs related to such work shall be the responsibility of the Contractor.
- D. Erosion and Sediment Control: The Contractor will be required to reduce to a minimum any quantity of soil or silt from entering surrounding areas by using reasonable and acceptable construction practices. Temporary baled hay or straw check dams or silt fences shall be provided every two hundred feet (200') along excavated ditches. Silt fences shall be erected around all disturbed areas. All work shall be in accordance with "Maine Erosion and Sediment Control Handbook for Construction: Best Management Practices."

3.2 EXCAVATING

- A. Depressions resulting from removal of surface or subsurface obstructions shall be opened to equipment working width and be removed of all debris and soft material as directed by the Engineer.
- B. Other areas: Excavate to grades shown on drawings. Where grades are not shown on the drawings, excavate as required to accommodate the installation.
- C. Over Excavation: Backfill and compact all over excavated areas as specified for fill below at no additional cost to the Owner. For over excavation below slabs-on-ground, backfill to the required levels with crushed stone or gravel, placed and compacted in 6" layers to a stable condition, at no additional cost to the Owner.
- D. Excavations shall be of size required to permit other trades to carry out their work properly and shall include the removal of all materials encountered within the lines and levels, as required by the drawings.
- E. Bids shall be submitted on the basis that all excavated material is "unclassified," hereby defined as material of every nature and description, no matter what size and composition or method of removal.
- F. Should unsatisfactory soil or bearing conditions be found at the levels and grades indicated on the drawings, notify the Engineer. If directed by the Engineer, excavate to new levels and grades.
- G. Footings and foundations shall be placed only on approved undisturbed material. If excavations under foundations are carried below authorized levels, the foundations or footings shall be increased in depth at no additional cost to the Owner.
- H. Protect active utilities encountered. Remove inactive utilities.

3.3 EXCESS WATER CONTROL

- A. Unfavorable weather: Do not place, spread, or roll and fill material during unfavorable weather conditions. Do not resume operations until moisture content and fill density are satisfactory to the Engineer.
- B. Provide, maintain, and operate pumps and related equipment, including standby equipment, of sufficient capacity to keep excavations free of water until structures attain full strength.
- C. Maintain ground water in bearing strata at a safe level at all times by methods which prevent loss of fines or other disturbance to these strata. If the methods employed have not been adequate and the bearing value of the soil has been reduced, remove disturbed soil as directed and replace with compacted gravel or concrete at no expense to the Owner.

3.4 FILL AND COMPACTION

- A. Filling: After subgrade compaction has been approved by the Engineer, spread approved fill material in layers not exceeding 8" in uncompacted thickness. Water or aerate the fill material as necessary, and thoroughly mix to obtain a moisture content which will permit proper compaction. Compact each soil layer to at least the specified minimum degree. Repeat compaction process until plan grade is attained.

- B. Compaction Equipment and Procedures: All load bearing fill material shall be compacted to prevent undue settlement. The standard compaction equipment shall be a rubber-tired vehicle sufficiently loaded and with sufficient number of passes so that the unit dry weight of the compacted material including the plus No. 4 fraction is equal to or greater than 95% of the maximum unit dry weight of material compacted in the laboratory under ASTM D1557 compaction specification. In restricted areas, small vibrating or impact machines shall be employed to obtain the same compaction results. Deviation from this standard may be requested by the Contractor or required by the Engineer based on the existing conditions.
- C. Compaction Control: The Contractor shall place the soil, prior to compaction in uniform lifts not exceeding 8" in depth. At the start of the earthwork the Contractor shall work closely with the Engineer to establish compaction procedures and optimum water content of the gravel and fill.

3.5 GRADING

- A. Subgrades: The word "subgrade" as used herein means the required surface of the subsoil or of ordinary fill. This surface is immediately beneath the loam, gravel base, or other surface improvement. Dimensions between finished grade and subgrade are indicated on the drawings.
- B. Establish subgrades accurate to within 1-1/2".
- C. Set sufficient grade stakes as determined by the Engineer to insure correct line and grade of all subgrades.
- D. Obtain a subgrade of uniform bearing strength.
- E. Maintain subgrades in satisfactory condition and properly drained until surface improvement is placed.

3.6 GRAVEL FILL PLACEMENT

Carefully place the specified gravel fill in areas to receive concrete slabs on grade, uniformly attaining the thickness indicated on the drawings, and providing all required transition planes.

3.7 TRENCHING

- A. General: Perform all trenching required for the installation of items where the trenching is not specifically described in other Sections of these Specifications. Unless otherwise indicated, provide separate trench for each utility. Make all trenches open vertical construction with sufficient width to provide free working space at both sides of the trench and around the installed item as required for caulking, joining, backfilling, and compacting.
- B. Depth: Trench as required to provide the elevations shown on the drawings. Where elevations are not shown on the drawings, trench to sufficient depth to give a minimum of 18" of fill above the top of pipe, measured from the adjacent finished grade.
- C. Pitch: trenches as required for drainage pipe.
- D. Bottom of water service trench shall be no less than 7' below finished grade unless otherwise indicated on the drawings.
- E. Correction of faulty grades: Where trench excavation is inadvertently carried below proper elevations, backfill with material approved by the Engineer, and then compact to provide a firm

and unyielding subgrade and/or foundation to the approval of the Engineer and at no additional cost to the Owner.

- F. Unless otherwise indicated, trench shall be 36" wide for 20" or smaller pipe; for larger pipe, trench width shall be 8" maximum on each side of pipe.
- G. Trenches for underground electrical and telephone work shall be a minimum of 2'-6" below finish grade to top of cable, with spacing between conduit or cable as required by utility companies and local authorities. Refer to the electric site drawing for locations and sizes of conduit, cables, and lines.
- H. Trench bracing: Properly support all trenches in strict accordance with all pertinent rules and regulations. Brace, sheet, and support trench walls in such a manner that they will be safe and that the ground alongside the excavation will not slide or settle, and that all existing improvements of every kind, whether on public or private property, will be fully protected from damage. In the event of damage to such improvements, immediately make all repairs and replacements necessary to the approval of the Engineer at no additional cost to the Owner. Arrange bracing, sheeting, and shoring so as to not place stress on any portion of the completed work until the general construction thereof has proceeded far enough to provide sufficient strength.
- I. Removal of trench bracing: Exercise care in the drawing and removal of sheeting, shoring, bracing, and timbering to prevent collapse and caving of the excavation faces being supported.
- J. Grading and stockpiling trenched material: Control the stockpiling of trenched material in a manner to prevent water running into the excavations. Do not obstruct surface drainage but provide means whereby storm and wastewaters are diverted into existing gutters, other surface drains, or temporary drains.
- K. Excavation for manholes and other related structures shall be as necessary, but with 12" minimum clearance on all sides.

3.8 FOUNDATION FOR PIPES

- A. General: Grade the trench bottoms to provide a smooth, firm, and stable foundation free from rock points throughout the length of the pipe, level except for drainage pipe.
- B. "Invert" or "invert elevation" is the elevation at the base of the pipe at its inner surface, or flow line. "Bottom of pipe" is the elevation at the base of the pipe at its outer surface.
- C. Subsurface conditions: Where soft, unstable materials are encountered at the surface upon which cohesionless material is to be placed, remove the unstable material, and replace it with material approved by the Engineer. Make sufficient depth to develop a firm foundation for the item being installed. The need for over excavation as a result of an act or failure to act on the part of the Contractor shall be executed and replaced at no additional cost to the Owner.
- D. Shaping: At each joint in pipe, recess the bottom of the trench as required into the firm foundation in such a manner as to relieve the bell of the pipe of all load and to ensure continuous bearing of the pipe barrel on the firm foundation; or place a minimum of 6" of ½" nominal size drainage fill in the bottom of the trench, up to the third point in that pipe. Accurately shape all pipe subgrade and fit the bottom of the trench to the pipe shape. Use a drag template shaped to conform to the outer surface of the pipe if other methods do not produce satisfactory results.
- E. Cut holes as necessary for joints and joint making.

3.9 HAND LAID RIPRAP

Stone shall be laid in accordance with construction requirements of the State of Maine Department of Transportation Standard Specifications, Section 610. Review material specification and procedure with the Engineer before the start of work.

3.10 BEDDING FOR PIPES

- A. General: By hand, place earth without rock fragments or large stones simultaneously on each side of the pipe for the full width of the trench, to a maximum depth of 3' and a minimum depth of 1' above the outside diameter of the pipe barrel. Tamp in layers not more than 6" deep, taking care not to disturb pipe.
- B. Densification: Densify the bedding material after placing by thoroughly saturating with water and vibrating with jetting equipment and a concrete vibrator stinger or with a rammer of suitable weight, at maximum intervals of 2' along both sides of the pipe. Take special care to provide firm bedding support on the underside of the pipe and fittings for the full length of the pipe.

3.11 BACKFILLING PIPES

- A. After the pipe has been thoroughly bedded and covered, spread backfill as specified in this section in uniform lifts of not more than 8" in uncompacted thickness, and then compact as specified in this section. Repeat the spreading and compacting procedure until adjacent grade level is attained.
- B. Coordinate all utility trench backfilling with the mechanical and other trades involved.

3.12 TESTING

- A. Provide compaction testing of all asphalt and concrete paved areas. There shall be sufficient number of tests, spaced randomly throughout the paved areas to certify that compaction meets these specifications.
- B. Tests shall be done by a licensed testing company approved by the Engineer.

3.13 CLEAN-UP AND RESTORATION

Upon completion of operations, the Contractor shall leave the site in a clean, neat, and orderly condition, to the satisfaction of the Engineer. The Contractor shall fill all ruts, holes and depressions, level all mounds, and restore all areas surrounding the Contract operations and improvements remaining that have been damaged or disturbed.

SECTION 31 25 14.2
TEMPORARY EROSION and SEDIMENT CONTROL

PART 1 - GENERAL

1.1 **SECTION REQUIREMENTS**

- A. Provide all labor, equipment, materials and maintain temporary erosion control devices as specified herein and as shown on the Drawings.
- B. The Contractor shall be responsible for providing and maintaining all erosion control for the entire duration of the project. The site shall be stabilized and protected at all times with whatever means are necessary to prevent erosion and off-site sedimentation from occurring. The plans and specifications provide direction and methods which should and will be used; however, these may not be all-inclusive and other methods and BMP's may be required. The Contractor shall, at least weekly, review the site and the protection measures being used and determine if they are adequate to meet the requirement of minimizing erosion and preventing off-site sedimentation.
- C. Standards:
 - 1. Maine Department of Environmental Protection (MDEP), "Maine Erosion and Sediment Control BMPs," March 2003 or as later revised.
 - 2. MDEP Chapter 500 Stormwater Management; Appendixes A, B & C
- D. The site shall be stabilized and protected at all times with whatever means are necessary to prevent erosion and off-site sedimentation from occurring.
- E. Submittals: Contractor shall furnish to the Contracting Officer, in writing, his Erosion and Sediment Control Plan including proposed locations for storage of topsoil and excavated material before beginning construction. The plan shall also include an erosion control sequence and description of measures to be used to mitigate temporary erosion and shall meet the requirements of the MDEP standard noted above. A schedule of work shall accompany the work plan. Acceptance of this plan will not relieve the Contractor of the responsibility of completion of the work as specified.
- F. The plans and specifications provide direction and methods which should and will be used; however, these may not be all-inclusive and other methods and Best Management Practices (BMP's) may be required. The Contractor shall, at least weekly, review the site and the protection measures being used and determine if they are adequate to meet the requirement of minimizing erosion and preventing off-site sedimentation.
- G. Provide such erosion control measures as may be necessary to correct conditions that develop prior to the completion of permanent erosion control devices or as required to control erosion that occurs during normal construction operations.
- H. Construction operations shall comply with all federal, state, and local regulations pertaining to erosion control.
- I. After award of the Contract, but prior to commencement of construction activities, meet with the Contracting Officer to discuss erosion control requirements and develop a mutual understanding relative to details of erosion control
- J. Erosion control devices include, but are not limited to, mulch berms, silt fences, filter barriers, inlet protection, rock check dams, hay bales, sand bags, dewatering bags or constructions,

landscaping, and similar items. The extent of erosion control is only partially shown on the Drawings. The Contractor shall also furnish and install all erosion control measures, which are required by other related authorities, such as DEP, local boards, and all other similar entities.

- K. The Contractor shall follow the conditions of any State permitting with regard to sedimentation and erosion control. A log of erosion control device inspections and measures taken to improve such shall be maintained by the Contractor for the duration of the project. This maintenance log shall be produced by the Contractor upon request by the Government or MDEP.
- L. Design Criteria
 - 1. Conduct all construction in a manner and sequence that causes the least practical disturbance of the physical environment.
 - 2. Stabilize disturbed earth surfaces in the shortest time and employ such temporary erosion control devices as may be necessary until such time as adequate soil stabilization has been achieved.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stone: Stone for use in stone check dams shall consist be a clean material with no fines and be of hard, durable rock and shall conform to the following table:

<u>Sieve Designation</u>	<u>% By Weight Passing Square Mesh Sieves</u>
6"	90-100
1 ½"	0-40
No. 4	0-5

- B. Temporary Erosion Control Blankets. Basis of design: North American Green S75
- C. Water: Contractor shall provide water and equipment to control dust, as required by job conditions.
- D. Dewatering Bags. Basis of Design: Dandy Dewatering Bags, as manufactured by Dandy Products; Grove City, Ohio 43123, www.dandyproducts.com.
 - 1. The Dewatering Bag shall be a bag sewn of nonwoven fabric **in the U.S.A.** using a double needle machine and a high strength thread.
 - 2. The Dewatering Bag shall have a spout opening large enough to accommodate at least a four (4) inch pump discharge hose with an attached strap to tie unit closed.
 - 3. The Dewatering Bag Seams shall be a double stitched "J" type seam with an average wide width strength per ASTM D-4884 of 60lb/in for an 8 oz. fabric manufactured in the U.S.A. with the following characteristics:

PROPERTY	TEST METHOD	UNITS	MARV
Grab Tensile Strength	ASTM D 4632	kN (lbs)	0.9 (205)
Grab Tensile Elongation	ASTM D 4632	%	50
Puncture Strength	ASTM D 4833	kN (lbs)	0.58 (130)
Mullen Burst Strength	ASTM D 3786	kPa (psi)	2618 (380)

Trapezoid Tear Strength	ASTM D 4533	kN (lbs)	0.36 (80)
% Open Area	COE -22125-86	%	N/A
Apparent Opening Size	ASTM D 4751	mm (US Std Sieve)	.0180 (80)

- E. Silt Fence shall meet the requirements of AASHTO M-288.
- F. Mulch Berms: Berms shall be constructed from stump grindings which have sufficient earth mixed with the woody material to provide adequate flow retardance to water. Wood chips without earth mixed in are insufficient to provide adequate sedimentation barriers.
- G. Mulch:
 - 1. Straw mulch shall consist of long fibered straw derived from oats, wheat, rye, or other cultivated grains, reasonable free from weeds and other undesirable material. No material shall be used which is so wet, decayed or compacted as to inhibit even and uniform spreading. No chopped hay, grass clippings, or other short fibered material shall be used unless directed.
 - 2. Cellulose fiber mulch shall consist of elongated wood fibers from virgin or recycled sources and post consumer newsprint. The woods fibers shall be tested to show no lead, asbestos or other heavy metals exceeding EPA toxic levels. Cellulose fiber mulch shall be free of refuse, physical contaminants, and material toxic to plant growth. Cellulose fiber shall not contain more than 30% post-consumer newsprint.
- H. Mulch Binder: Shall consist of a commercially developed product for the tacking of hay or straw. Binder shall be free of refuse, physical contaminants, material toxic to plant growth, or asphalt. Paper fiber mulch may be used as a binder at the rate of 3 kg/m^2 [0.6 lb/ft^2]. Paper fiber mulch shall consist of 100% post consumer newsprint processed to be applied hydraulically.

PART 3 - EXECUTION

3.1 NARRATIVE

- A. Erosion will be controlled with two main methods. The first shall be to reduce initial erosion by protecting bare soils. Regular mulching shall be applied throughout construction to minimize initial disturbance and soil particle suspension in water run-off. The secondary method shall be to control and catch sediment which may become suspended in the run-off. This shall be done through the use of stone check dams, silt fence, inlet protection and mulch berms. Areas cleared of woody vegetation and roots may have this vegetation ground, mulched, and then used to create berms through which storm water can percolate.

3.2 INSTALLATION

- A. The following is intended to provide a minimum standard for the erosion control plan. Different or more stringent steps BMP's or actions may be required.
- B. Areas to be cleared may have the stumps of trees ground up on site and used for erosion control
- C. Temporary Erosion Checks: Construct temporary erosion checks in ditches and other locations as required to minimize erosion.
- D. Any disturbed areas to be left in rough graded form for more than 30 days but less than one growing season shall be limed, fertilized, temporary seeded and mulched.

- E. All disturbed areas shall be stabilized with lime, fertilizer, seed, and mulch at the completion of the project. Permanent seeding shall meet the requirements of the seeding portion of the specifications and be based on the anticipated use. Permanent seeding shall be installed immediately upon reaching final grade.
- F. After seeding, areas disturbed shall be mulched as described in MDOTSS section 619. Hay shall not be used. Straw shall be used.
- G. Temporary construction entrances shall be constructed at all locations used for access to or from areas where significant tracking of soils is likely to occur. The entrance shall be built of 1 ½" crushed stone, the full width of the access and at least 50' in length or as detailed on the drawings. The exact location and application of these entrances shall be determined by the Contracting Officer.
- H. Weekly, or after precipitation producing the equivalent of one-half inch of rainfall or snowmelt, all mulched areas shall be inspected for suitability for erosion control and slope protection. Weakened areas shall be re-mulched as noted above.
- I. Every week and after precipitation producing the equivalent of one half inch of rainfall, the contractor shall inspect and maintain all erosion control measures. Maintenance shall include, but not be limited to removal of sediment from silt fence or berms if soil accumulates to a depth of one-half the fabric height; repair of stone check dams if runoff channelizes under or around the stone; removal of excess accumulated sediment from dewatering and inlet protection devices; and washing of temporary construction entrances.
- J. Erosion control mat shall be installed on all slopes in excess of 3:1 (H:V).
- K. When permanent soil stabilization has been achieved, such temporary materials and devices that are unsightly in appearance or not readily degradable shall be removed.
- L. Reuse: Materials and devices of suitable type and condition may be reused at other on-site locations when approved by the Contracting Officer. Materials and devices, determined by the Contracting Officer to be unsuitable for reuse, shall become the Contractor's property and shall be disposed of in a manner and location approved by the Contracting Officer.
- M. Dewatering bags shall be removed from the site and disposed of in manner meeting local, State, and Federal requirements.

3.3 MULCHING

- A. Straw mulch for both seeded and unseeded areas shall be spread evenly and uniformly over the designated areas. Unless otherwise directed, mulch shall be applied at the rate of 1.5 ton to 2 ton/acre. Too heavy an application of mulch shall be avoided. Lumps and thick mulch material shall be thinned.
- B. Unless otherwise authorized, straw mulch shall be anchored in place by uniformly applying an acceptable mulch binder. Mulch binder shall be applied as soon as the mulch is placed. Application of a concentrated stream of mulch binder will not be allowed. Mulch binder will be paper fiber mulch applied at 5 lbs/Unit or approved equal. Water spray may be used as a temporary binder.
- C. Temporary mulching shall be applied as required to maintain proper erosion control and seed cover, spread immediately to protect soil from erosion during all stages of construction throughout all seasons of the year.

- D. Cellulose Fiber Mulch shall be applied as a waterborne slurry. The cellulose fiber and water shall be thoroughly mixed and sprayed on the area to be covered so as to form a uniform mat of mulch at the rate of not less than 40 lb of mulch material per 1000 ft² unit of area.
- E. Cellulose fiber mulch may be mixed with the proper quantities of seed, fertilizer, and agricultural limestone as required may be applied separately the same day as seeding.
- F. The Contractor shall maintain the straw, or fiber mulch by repairing all damaged mulch and by correcting all shifting of the mulch due to wind, water, or other causes, until an acceptable growth of grass has been achieved.
- G. If cellulose fiber mulch is used, any reseeding will require additional cellulose fiber mulch.

3.4 EQUIPMENT & FUELING

- A. Minimum equipment/vehicle fueling and maintenance practices that will be implemented to control pollutants to stormwater (e.g., secondary containment, drip pans, spill kits, etc.)
- B. Equipment Fueling: Equipment is to be fueled in designated areas on site. Fueling equipment is to be maintained according to OSHA regulations. Spill cleanup materials are to be provided by the operators of the equipment or the owners of the fueling equipment. Cleanup materials are to be present near the fueling area and clearly labeled.
- C. Equipment Repair and Maintenance: Unless vehicle cannot be moved without incurring further damage, no repairs are to occur on site. If a machine is creating a pollution problem, it must be removed from the site. No equipment will be permitted on site that is leaking any fuels, fluids, or lubricants. Any and all routine maintenance is to occur offsite.
- D. Maintenance and Inspections shall occur daily

3.5 SPILL PREVENTION AND CONTROL

- A. All chemical agents are to be stored in OSHA and DOT approved containers, if applicable. All chemicals are to be stored in a safe manner, and stored in a secondary containment unit whenever possible (i.e., fuel cabinet, concrete spill containment tank, etc.) Cleanup materials are to be present near the chemical storage area and clearly labeled. Spill cleanup materials are to be provided by the owners of the material.
- B. In the event of a spill, Park Dispatch (288-8791) and the Contracting Officer are to be notified of spill immediately. Spill is to be contained as quickly as possible, with provided cleanup materials. Spilled materials must be prevented from entering stormwater system. In the event of a spill for which there are inadequate cleanup materials, spill is to be contained with earth dikes until other measures can be implemented. Spilled chemicals and cleanup materials are to be isolated and disposed of according to Superintendent's instructions. Superintendent is to post and maintain a contact list of disposal resources in job trailer. Included in this list shall be emergency contact numbers for the manufacturers of any material brought on site by any subcontractor.
- C. Contractor will be responsible for response training for all employees on the site, as well as the foreman of each subcontractor on site. Foreman of subcontracting companies will be responsible for training each of their own workers in spill response. Subcontractors are to provide Superintendent with written confirmation that this training has been performed.

SECTION 33 00 00
SITE UTILITIES

PART 1 - GENERAL

1.1 **SCOPE**

- A. Furnish all materials, labor, and equipment required to complete all site utility work shown on the drawings and/or specified herein including but not limited to the following:
1. Water Main Distribution
 2. Storm Sewers
 3. Sanitary Sewers
 4. Foundation Drainage
 5. Electrical Distribution
 6. Sewage Lift Pumps and Basin
 7. Subsurface Sewage Disposal System

1.2 **CODES**

All work shall conform to the State Plumbing Code and all local codes as applicable. This Contractor shall pay all necessary fees, licenses, and permits.

1.3 **RECORD DRAWINGS**

The Contractor shall keep on the job a set of drawings on which to record the "as-built" conditions as the work progresses. At the conclusion of work, the record drawings shall be turned over to the Engineer.

1.4 **RELATED WORK SPECIFIED ELSEWHERE**

- A. Site Work
- B. Cast-In-Place Concrete
- C. Plumbing
- D. Electrical

1.5 **SUBMITTALS**

- A. Manufacturers' Catalog data or specification sheets, six copies, of items described herein shall be submitted for approval in accordance with these same requirements.
- B. Submit Shop Drawings on all of the following:
1. Precast Structures
 2. Frames and Covers
 3. All piping, fittings, valves, etc.
 4. All test reports

1.6 **VERIFYING MEASUREMENTS**

Verify all scale measurements indicated on plans with existing work and conditions found at the site and accommodate work thereto.

PART 2 - PRODUCTS

2.1 WATER DISTRIBUTION

- A. Underground Water Main Piping: See Plumbing Plan.
- B. Underground Service Piping: shall consist of Type K annealed copper tubing, acrylonitrile-butadiene-styrene (ABS), polyvinyl chloride (PVC) or polyethylene rated for a minimum pressure of 150 psi. Fittings shall be suitable for the type of pipe used.
- C. Concrete Thrust Blocks: The General Contractor shall install concrete thrust blocks at all changes of direction in water piping of 22.5 degrees or greater, or at any other point in the piping where anchors are deemed necessary by the Engineer. Soil bearing pressure shall be taken as 2,000 psf for anchor design. Care shall be taken that all joints are completely accessible at pipe anchors. The Contractor shall furnish and install tie rods at all points where necessary and where directed by the Engineer.
- D. Adapters shall be furnished to match existing fire fighting equipment.
- E. The Contractor shall provide the Owner with two hydrant wrenches.

2.2 STORM SEWERS

- A. Polyethylene Pipe shall be equal to Hi-Q Sure-Lok as manufactured by Hancor, Inc.
- B. HDPE Pipe shall be ASTM D3350 with a closed cell classification; bell and spigot end joints. Pipe and fittings shall meet AASHTO M294. Joints shall be flexible elastomeric seals conforming to ASTM D3212.
- C. MDOT Type B Underdrain shall be 4" minimum diameter perforated rigid pipe, SDR35. All drains shall be covered with spunbond filter fabric type S115 or equal as supplied by Shurtleff Co. Fabric to be laid 12" above top of pipe. Pipe shall have 5/8" holes and be underdrain type pipe.

2.3 SANITARY SEWERS

- A. Polyvinyl Chloride PVC Non-Pressure Sewer Pipe, conforming to ASTM D3034, SDR 35. Joints shall be flexible elastomeric seals meeting ASTM D3212. All joints shall be integral to the pipe bell.
 - 1. Polyvinyl Resin compound shall conform to ASTM 1784.
 - 2. Rubber gaskets for use with PVC pipe shall meet ASTM D1869.
- B. Sewer pipe fittings shall be same as pipe material, molded or formed to suit pipe sizes and end design, in wyes, bends, elbows, cleanouts, reducers, traps, etc.

2.4 FOUNDATION DRAINAGE

- A. Foundation (perimeter-inside and out) drains shall be 4" diameter perforated rigid ABS pipe, SDR 33.5. All perimeter drains shall be covered with "Trevira" spunbond filter fabric type S115 or equal as supplied by Shurtleff Co. Fabric to be laid 12" above top of pipe over 12" fill as shown on drawings. Pipe shall have 5/8" holes and be "underdrain" type pipe.

2.5 SEWAGE LIFT PUMPS AND BASIN

- A. Refer to HHE-200.

2.6 SUBSURFACE SEWAGE DISPOSAL SYSTEM

- A. Refer to HHE-200.

PART 3 - EXECUTION

3.1 POLE RESTRAINT

- A. Completion of the work may require temporary restraint of power poles. The Contractor shall obtain all necessary permits, pay all fees, and full coordinate his activities as required by the local power utility.

3.2 UTILITY STRUCTURES

- A. Utility structures shall be constructed as shown on the drawings. Utility structures may be constructed of poured reinforced concrete, precast concrete blocks, brick, or prefabricated units. Prefabricated units must be approved by the Engineer, and shop drawings must be submitted.
- B. Utility Structures
 - 1. Establish pipe invert elevations for all incoming and outgoing pipes as indicated on Contract Drawings.
 - 2. Place structures on compacted foundation of $\frac{3}{4}$ inch crushed stone of not less than twelve (12) inches depth and not less than 12 inches wider than manhole base.
 - 3. Install precast barrel sections to minimize use of precast rings for shimming frames and covers to finish grade.
 - a. In no case shall precast ring shimming exceed one foot in height.
 - 4. Tightly seal all joints with 2 strips of Kent Seal No. 2 or approved equal.
 - 5. Excavation Drainage.
 - a. Provide temporary channels as required for water flowing along or across work site.
 - b. Pumped or drained water: Suitable disposed, causing no damage to adjacent property or interference with work.
 - c. In no case is drainage to be allowed through pipes being installed.
- C. Utility structures shall not be constructed when the temperature is below 32 degrees Fahrenheit. Protect the work from freezing.
- D. Base slabs must be placed upon properly prepared subgrades. Bond walls to base slabs.
- E. Sewer Invert channels shall be smooth and accurately shaped.
- F. Brick and block used to meet finished grade shall be clean and thoroughly wetted down before laying. All joints shall be completely filled and struck to a smooth finish. No structure shall be backfilled until the mortar bond has reached full strength.
- G. Set top of cast iron frame or grate at exact rim elevation.

3.3 TRENCHING

- A. The trench for the pipe shall be excavated to the required line and grade and of sufficient width to permit thorough tamping of the fill material under the haunches and around the pipe. Soft or unsuitable material encountered below the normal bedding line of the pipe shall be removed as directed, replaced with selected materials, gravel, or crushed stone, and thoroughly compacted. The bottom of the trench shall be excavated to accommodate the bells of the pipes.

- B. If any cross pipes, conduits, drains, or other unforeseen obstacles are encountered in the excavation, the grade of the bottom of the trench may be raised or lowered during the excavation operation as directed.

3.4 LAYING PIPE - GENERAL

- A. Weather Conditions: All excavations are to be kept dry and free of ice and frozen soil while pipe is being laid. No pipe shall be laid in water, on frozen trench bottom or when, in the opinion of the Engineer, the trench conditions or the weather are unsuitable for work.
- B. Inspection of Materials: The pipe and accessories shall be inspected for defects prior to lowering into the trench. Any defective, damaged, or unsound materials shall be replaced.
- C. Protection of Materials: All foreign matter or dirt shall be removed from the interior of pipe and accessories before lowering into position in the trench. Exposed ends of all pipes shall be protected with an approved stopper to prevent earth and other substances from entering the pipe. Pipe shall be kept clean during and after laying.
- D. All pipe, fittings and accessories shall be carefully lowered into the trench using suitable equipment, in such a manner as to prevent damage to pipe and fittings. Under no circumstances shall pipe or accessories be dropped or dumped into the trench.
- E. Installation and Assembly of Pipe: All pipes shall be laid with extreme care as to grade and alignment. The ends of pipes to be jointed, the gaskets, and inside of sleeves or bell ends shall be wiped clean immediately before jointing the pipes. Each pipe shall be so laid as to form a close joint with the next adjoining pipe and to bring the inverts continuously to the required grade. The bell end shall be toward the rising grade and each section of pipe shall have a firm bearing throughout its length. Suitable coupling holes shall be dug to provide ample space for making joints. No blocking shall be used.
- F. The assembly of the coupling shall be made as recommended by the manufacturer. The end of the pipe which enters masonry shall be neatly cut to fit the inner face of the masonry as shown on the drawings.
- G. In order to insure a minimum amount of movement or disturbance, no more than two lengths of pipe may be laid before backfilling to a minimum of 12 inches over the pipe. No walking upon or working over the pipes after they are laid will be permitted until they are covered with earth to a depth of at least 12 inches, except as may be necessary in tamping the earth and backfilling.
- H. Relaying of Pipe: All pipe which is not laid to grade and alignment shall be re-laid to the satisfaction of the Engineer, without additional cost to the Owner.
- I. Backfilling: The pipe shall be bedded in sand of uniform density, carefully shaped to fit the lower part of the pipe exterior for at least 10 percent of its overall height. Where rock in either ledge or boulder formation is encountered, it shall be removed to a line 6 inches below the bottom of the outside of the pipe barrel.
No part of any rock remaining in the trench shall come within 6 inches of any portion of the pipe.

Pipe shall be imbedded in sand from 6 inches below the pipe to 6 inches above the pipe.

Each layer, if dry, shall be moistened and then compacted by rolling or by tamping with mechanical rammers. Compaction with iron hand tampers having a tamping face not exceeding 25 sq. in. in area may be allowed, but only after permission is given by the Engineer. Special care shall be taken to thoroughly compact the fill under the haunches of the pipe. This method of filling and compacting shall be continued until the material is level with the top of the pipe.

The remainder of the filling shall consist of suitable material placed in successive layers not more than 6 inches in depth.

Each layer shall be thoroughly compacted as specified above. Puddling the backfill will not be permitted.

Trenches crossing roads, walks and parking areas shall be backfilled with gravel borrow and compacted to not less than 95 percent of the maximum dry density.

3.5 WATER LINE INSTALLATION: of copper tubing, ductile iron pipe and plastic pipe shall be in accordance with the manufacturer's recommendations.

- A. Copper Tubing: joints shall be silver soldered. Tubing shall be cut square and burrs shall be removed. Both inside of the fittings and the outside of the tubing shall be well cleaned with steel wool before sweating. Care shall be taken to prevent annealing of the fittings and hard drawn tubing when making connections. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted.
- B. Ductile Iron Pipe: All parts of the joint and gasket shall be cleaned with water just prior to assembly. Check to confirm that the gasket is evenly seated prior to bolting. All bolts shall be torqued in accordance with the range specified by the manufacturer.

3.6 WATER LINE CLEANING AND TESTING

- A. Cleaning: All piping shall be blown out and made clean and free from scale, water, or sludge.
- B. Disinfect all pipes per procedure outlined in AWWA. The Contractor shall be responsible for all sterilization of water piping required by State and local codes. The Contractor shall make all arrangements for such sterilization and all State and local authorities required by code shall be informed in writing one week prior to the sterilization work, in order that they may be present during this work.
- C. Testing: All tests shall be witnessed by the Engineer or by the Architect's authorized agent. The local plumbing inspector shall be notified sufficiently in advance of all tests in order to observe them.
- D. Water piping shall be tested to a hydrostatic pressure of 150 lbs. per square inch, and it shall hold tight for a period of two hours. All joints of pipe being tested shall remain exposed until testing is complete and all leaks are located and repaired.
- E. If inspection or tests show defects, such defective work and materials shall be replaced, and inspection and tests repeated. All repairs to the piping shall be made with new material. No caulking of screwed joints or holes will be acceptable.

3.7 SEWER LINE INSTALLATION

Installation of plastic pipe or ABS pipe shall be in accordance with the manufacturer's recommendations.

3.8 SUBSURFACE SEWAGE DISPOSAL SYSTEM

- A. Starting 8' outside of the building furnish and install all labor and materials to complete the septic system as herein specified or shown on the drawings.

- B. Obtain the necessary permit(s) to install the required septic system. An on-site soils investigation has been completed and paid for by the Owner and the report (HHE-200) will be made available to the Contractor.
- C. Excavate, trench, backfill and grade as required for the septic system including all piping, chambers, septic tanks, distribution box and pump chamber.
- D. Excess material shall be utilized for site grading on the Owner's property.
- E. Topsoil shall not be removed from the area to be used for leaching beds.
- F. The Contractor shall seed the area of work after final grading.
- G. Install concrete riser blocks with cover on septic tanks to bring cover flush with ground surface.

3.9 MANHOLE, CATCH BASIN, VAULT TESTING

A. General:

- 1. Perform vacuum tests on all manholes.
- 2. All testing must be performed in the presence of the Engineer.

B. Vacuum test:

- 1. The vacuum test shall be performed after backfilling the manholes. The boot clamps shall be properly tightened to prevent the boot from being sucked into the manhole. Proper bracing of stub ends is required. The test shall be run at the following rate and test times.
 - a. For 4' or 6' diameter manholes:
 - 1) Initial pressure test – 10" Hg (i.e., 20" HG absolute).
 - 2) Test time – 1" Hg drop to 9" Hg in 2 minutes minimum allowable, for 0 – 10" deep manholes, 2½ minute minimum allowable for 10'-15' deep manholes; 3 minutes minimum allowable for 15'-25' deep manholes.
- 2. If pressure drop exceeds 1" Hg within the specified time the manhole shall be repaired and retested until it passes the vacuum test.
 - a. If manhole cannot be sealed from the interior, it shall be excavated, the seals repaired and as necessary and re-backfilled prior to testing.
 - b. All tests for acceptance of the completed manhole shall be accomplished only in the presence of the inspection Engineer.

3.10 CLEAN UP AND REPAIR

- A. Upon completion of catch basin installation, each structure shall be cleaned of any accumulation of silt, debris, or foreign matter of any kind and shall be kept clear of such accumulation until final acceptance of the work.
- B. Any pipe which is not in true alignment, or which shows any undue settlement after being laid shall be taken up and re-laid.
- C. Prior to placing the backfill, damaged areas of coupling bands and pipe shall be repaired with the type of coating used on the original pipe. Pipe on which the coating has been damaged to such an extent that satisfactory field repairs cannot be made shall be removed and replaced without additional cost to the Owner.

SECTION 33 40 00
SITE DRAINAGE

PART 1 - GENERAL

1.1 **SCOPE**

Furnish all necessary labor, materials, tools, and equipment; and excavate, install, construct, and backfill the storm drainage system, including pipes, culverts, rip rap, pipe trenches, and associated appurtenances, as shown on the drawings and specified herein.

1.2 **WORK OF OTHER SECTIONS**

Excavating, trenching, and backfilling for the storm drainage lines.

1.3 **APPLICABLE STANDARDS**

- A. **General:** Comply with standards specified in this Section.
- B. **Off-Site Drainage Structures:** For connection of the on-site storm drainage to the existing storm drainage system in the street, secure all required permits and approvals, and construct in strict accordance with the requirements of the governmental agency having jurisdiction.

1.4 **QUALIFICATIONS OF INSTALLERS**

Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.5 **PRODUCT HANDLING**

- A. **Protection:** Use all means necessary to protect the materials of this Section before, during and after installation and to protect the work and materials of all other trades.
- B. **Protection of Utilities:** Protect existing utilities as specified.
- C. **Delivery and Storage:** Deliver all materials to the job site in their original containers with all labels intact and legible at time of use. Store in strict accordance with the manufacturers' recommendations as approved by the Engineer.
- D. **Replacements:** In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 **MATERIALS**

- A. MDOT TYPE B Underdrain shall be 4" diameter perforated rigid pipe, SDR 35. All drains shall be covered with "Trevira" spunbond filter fabric type S115 or equal as supplied by Shurtleff Co. Fabric to be laid 12" above top of pipe. Pipe shall have 5/8" holes and be "underdrain" type pipe.
- B. Foundation (perimeter-inside and out) drains shall be 4" diameter perforated rigid ABS pipe, SDR 33.5. All perimeter drains shall be covered with hay, or if noted, "Trevira" spunbond

filter fabric type S115 as supplied by Shurtleff Co. Fabric or hay to be laid 1'0" above top of pipe over 1-1 1/2" fill as shown on drawings. Pipe shall have 5/8" holes and be "underdrain" type pipe.

- C. Foundation drain outfalls shall be 4" diameter solid rigid ABS pipe, SDR 23.5, sloped to drain. Stone-in end of drainage pipes with drainage fill material in order to protect pipe from freeze-up but allow drainage.
- D. Polyvinyl Chloride (PVC) Pipe: Pipe and fittings shall comply with ASTM D 3034, rated SDR 35. Pipe shall be continually marked with manufacturer's name, pipe size, cell classification, SDR rating, and ASTM D 3034 classification. Pipe joints shall be integrally molded bell ends in accordance with ASTM D 3034, Table 2, with factory supplied elastomeric gaskets and lubricant. PVC shall not be used for any drainage pipe, which will be permanently exposed to sunlight.
- E. Storm drain pipe shall be 15" diameter minimum H.D.P.E. dual wall perforated drainage pipe. Pipe shall have a smooth interior and be fitted with a bell and gasket joint assembly. Storm drain accessories shall be fabricated catch basin with 18" diameter cast iron grate and H.D.P.E. flared end for pipe outlet. Equal to TPO Plus by Plasti-Drain LTEE available from Public Works Supply Co., Inc. (1-800-291-5000).

2.2 DRAINAGE STRUCTURES

- A. General: Construct drainage structures of reinforced concrete to the dimensions and profiles shown on the drawings, or provide precast reinforced concrete structures with the same capacities as approved by the Engineer. Provide metal frames, covers or gratings, and fixed ladders as shown.
- B. Mortar: Comply with ASTM C270, Type M, for mortar for pipe joints and connections to drainage structures, and for manhole construction. Place within one hour after addition of water. Hydrated lime complying with ASTM C141, Type B, may be added to the mixture of sand and cement in an amount equal to 25 percent of the volume of cement. Provide a quantity of water in the mixture sufficient to produce a stiff workable mortar, clean and free from harmful acids, alkalies, and organic impurities.
- C. Reinforcing Bars and Dowels: Intermediate grade billet steel; comply with ASTM A615, Grade 40.
- D. Frames and Covers or Grating: Standard black finish, supplied as a total unit, sized as indicated on the drawings. Provide all items from the same manufacturer.
- E. Precast Concrete Catch Basins: Shall be designed to assure slope through the structure.

PART 3 - EXECUTION

3.1 INSPECTION

Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the timely and proper completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 EXCAVATING, TRENCHING, AND BEDDING FOR PIPES

- A. General: Provide excavating, trenching, and bedding for storm drains as follows.

- B. Movement of Construction Machinery: Use all means necessary to avoid displacement of, and injury to, the pipe and structures while compacting by rolling or operating equipment parallel with the pipe. Movement of equipment over a culvert or storm drain at any stage of construction is solely at the risk of the Contractor.
- C. Bedding: Provide a bedding surface for the pipe with a firm foundation of uniform density throughout the entire length of the pipe. Bed pipes carefully in a soil foundation accurately shaped and rounded to conform to the lower one-quarter of the outside perimeter of the circular pipe, or set the pipe in a bed of sand. Tamp bedding when necessary. Provide bell holes and depressions for pipe joints of only the length, depth, and width required for properly making the particular joint.

3.3 PLACING PIPE

- A. General: Carefully examine each pipe prior to placing. Promptly set aside all defective pipe and all damage pipe. Clearly identify all defects. Do not install defective pipe or damaged pipe.
- B. Place all pipe to the grades and alignment shown, with a tolerance of one in 1000 vertical and one in 500 horizontal.
- C. Provide all required equipment for lowering pipe safely into the trenches.
- D. Do not place pipe in water, or place pipe when trench or weather is unsuitable for such work.
- E. Concrete Pipe: Lay by proceeding upgrade with the spigot ends of bell-and-spigot pipe, and the tongue ends of tongue-and-groove pipe pointing in the direction of flow.
- F. Asphalt Coated Corrugated Metal Pipe: The pipe shall be laid upgrade, beginning at the lower end of the pipeline. Pipelines shall be laid to grades and alignment shown on the drawings or as directed by the Engineer.
- G. Aluminized Type II Pipe: The pipe shall be laid upgrade, beginning at the lower end of the pipeline. Pipelines shall be laid to grade and alignment shown on the drawings or as directed by the Engineer.

The pipe shall be laid in the prepared bed with the outside laps of circumferential joints pointing upgrade. Paved or partially lined culverts shall be laid with the lining on the bottom. The longitudinal laps parallel to the centerline of the pipe shall be placed on the sides of the pipeline with outside laps pointing down. Each section or joint of pipe shall be securely attached to the adjoining section or joint of pipe with connecting bands of other approved type of joint. The bands shall be tightly drawn or connected so that a rigid joint will be formed. Damage to the bituminous coating shall be repaired by applying hot asphalt to the exposed metal before any backfill is placed.

3.4 PIPE JOINTS

- A. Joining Concrete Pipe:
 - 1. Wipe the inside of the joint clean and smooth. In pipe too small for a person to work inside, perform wiping by dragging a suitable swab or long handled brush through the pipe as installation progresses. Protect the mortar bead on the outside from air and sun with suitable covering until cured.
 - a. Cement mortar bell and spigot joint: Bed the first pipe to the established grade line, with the bell end placed upstream. Clean surface of bell with wet brush and fill lower

portion with mortar to such depth as to bring the inner surface of the abutting pipes flush and even. Clean the spigot end of each subsequent pipe with a wet brush, and uniformly match into the bell so that sections are closely fitted. After laying each section, fill remainder of joint with mortar, and form a bead around the outside of the joint with mortar. If mortar can slump before setting, wrap or bandage the outside of the joint with cheesecloth to retain mortar in place.

- b. Flexible watertight joints: Make flexible watertight joints with rubber gaskets for concrete pipe. Design joints and use gaskets complying with ASTM C443 and shore durometer hardness, Type A, 40-55 in lieu of hardness specified. Allow no more than one splice, except two splices are acceptable in rubber gaskets larger than 140 cm (54"). Install gaskets and joint materials in accordance with the manufacturer's recommendations as approved by the Engineer. Affix gaskets and jointing materials to the pipe not more than 24 hours prior to installation of the pipe. Align the pipe with the previously installed pipe and pull the joint together. If, while making the joint, the gasket or jointing material becomes loose and can be seen through exterior joint recess when joint is pulled to within 1" of closure, remove pipe and remake joint.
- B. Joining Pipe of Different Sizes: Provide reducer fittings of the required sizes and configurations. Use saddle connection when branch lines join a main or collector main. Use eccentric collar joint when the slope of the pipe is less than 1 percent.
 - 1. Hand Laid Riprap: Shall be placed at ends of culverts, properly graded, and compacted as called for. Riprap shall be approximately true to the required slope line and grade and be uniform in appearance. Hand laid riprap or hand laid riprap face shall be random rubble, hand laid for the full depth in one operation to secure interlocking of all face stones and stones placed as backing.

Larger stones shall be laid at the base of the ditch. The stones shall be laid in close contact with the longer axis perpendicular to the plane of the slope and so as to stagger joints. All the openings between the stones shall be filled with spall or gravel and rocks securely rammed into place.

3.5 BACKFILLING

- A. General: Backfill in accordance with the provisions of Section 33 40 00, and as specified herein. Take all necessary care to assure thorough compaction of fill under haunches of the pipe, without damage or misalignment of the pipe. When approved by the Engineer, sheeting and portions of bracing used may be left in place. Do not leave untreated sheeting in place beneath structures or pavements.
- B. Backfilling Pipe in Fill Sections: For pipe placed in fill sections, after the backfill has reached at least 12" above the top of the pipe, place the remainder of the fill by compacting in layers not exceeding 8" in compacted depth.
- C. Compaction: Backfill over and around the pipe, backfill around and adjacent to all other drainage structures, and compact to the minimum densities specified in Section 33 40 00.

3.6 CLEAN UP AND REPAIR

- A. Upon completion of catch basin installation, each structure shall be cleaned of any accumulation of silt, debris, or foreign matter of any kind and shall be kept clear of such accumulation until final acceptance of the work.

- B. Any pipe which is not in true alignment, or which shows any undue settlement after being laid shall be taken up and relaid.
- C. Prior to placing the backfill, damaged areas of coupling bands and pipe shall be repaired with the type of coating used on the original pipe. Pipe on which the coating has been damaged to such an extent that satisfactory field repairs cannot be made shall be removed and replaced without additional cost to the Owner.

3.7 TESTING AND INSPECTION

- A. General: Provide all equipment and personnel necessary, and make all tests required to demonstrate that the work of this Section has been completed in strict accordance with the design and the specified requirements.
- B. Closing in Uninspected Work: Do not cause or allow any of the work of the Section to be covered up or enclosed until after it has been completely tested, inspected, and approved by the Engineer.
- C. Hydrostatic Tests of Watertight Joints: Make a hydrostatic test on each watertight joint type proposed. Test one sample joint of each type. If a sample joint fails because of faulty workmanship, test an additional sample joint. During the test period, protect the joint from high temperatures that might soften or adversely affect the jointing materials.
- D. Demonstrate that joints in reinforced and non-reinforced concrete pipe comply with ASTM C443. Make test at an internal hydrostatic pressure of 10 psi for 24 hours.
- E. Only joints within the building area, and within 10 ft. of the building exterior walls or face, need be tested for water tightness.

APPENDIX

HHE-200

Septic Design

SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION				Maine Department of Human Services Division of Health Engineering, 10 SHS (207) 287-5672 Fax: (207) 287-3165	
PROPERTY LOCATION				>> CAUTION: LPI APPROVAL REQUIRED <<	
City, Town, or Plantation	OLD TOWN	Town/City _____	Permit # _____		
Street or Road	COLLEGE AVENUE	Date Permit Issued ____/____/____		Fee: \$ _____ Double Fee Charged ☐	
Subdivision, Lot #	DEMERITT FOREST	Local Plumbing Inspector Signature _____		L.P.I. # _____	
OWNER/APPLICANT INFORMATION				☐ Owner ☐ Town ☐ State	
Name (last, first, MI) UNIV. OF MAINE SYSTEM c/o ☒ Owner R. RYAN WARD, DIR. OF SPACE AND CAPITAL ☒ Applicant		The Subsurface Wastewater Disposal System shall not be installed until a Permit is issued by the Local Plumbing Inspector. This Permit shall authorize the owner or installer to install the disposal system in accordance with this application and the Maine Subsurface Wastewater Disposal Rules.			
Mailing Address of Owner/Applicant MANAGEMENT SERVICES 5765 SERVICE BUILDING ORONO, MAINE 04469-5765					
Daytime Tel. # 207-991-2564					
OWNER OR APPLICANT STATEMENT I state and acknowledge that the information submitted is correct to the best of my knowledge and understand that any falsification is reason for the Department and/or Local Plumbing Inspector to deny a Permit. _____ Signature of Owner or Applicant Date _____		CAUTION: INSPECTION REQUIRED I have inspected the installation authorized above and found it to be in compliance with the Subsurface Wastewater Disposal Rules Application. _____ Local Plumbing Inspector Signature (1st) date approved _____ _____ Local Plumbing Inspector Signature (2nd) date approved _____			
PERMIT INFORMATION					
TYPE OF APPLICATION ☒ 1. First Time System ☐ 2. Replacement System Type replaced: _____ Year installed: _____ ☐ 3. Expanded System ☐ a. <25% Expansion ☐ b. >= 25% Expansion ☐ 4. Experimental System ☐ 5. Seasonal Conversion		THIS APPLICATION REQUIRES ☒ 1. No Rule Variance ☐ 2. First Time System Variance ☐ a. Local Plumbing Inspector Approval ☐ b. State & Local Plumbing Inspector ☐ 3. Replacement System Variance ☐ a. Local Plumbing Inspector Approval ☐ b. State & Local Plumbing Inspector ☐ 4. Minimum Lot Size Variance ☐ 5. Seasonal Conversion Permit		DISPOSAL SYSTEM COMPONENTS ☒ 1. Complete Non-engineered System ☐ 2. Primitive System (graywater & alt. toilet) ☐ 3. Alternative Toilet, specify: _____ ☐ 4. Non-engineered Treatment Tank (only) ☐ 5. Holding Tank, _____ gallons ☐ 6. Non-engineered Disposal Field (only) ☐ 7. Separated Laundry System ☐ 8. Complete Engineered System (2000 gpd or more) ☐ 9. Engineered Treatment Tank (only) ☐ 10. Engineered Disposal Field (only) ☐ 11. Pre-treatment, specify: _____ ☐ 12. Miscellaneous Components	
SIZE OF PROPERTY 907± ☐ SQ. FT. ☒ ACRES		DISPOSAL SYSTEM TO SERVE ☐ 1. Single Family Dwelling Unit, No. of Bedrooms: _____ ☐ 2. Multiple Family Dwelling, No. of Units: _____ ☒ 3. Other: <u>30 Seat Classroom</u> (specify) Current Use ☐ Seasonal ☐ Year Round ☒ Undeveloped		TYPE OF WATER SUPPLY ☒ 1. Drilled Well ☐ 2. Dug Well ☐ 3. Private ☐ 4. Public ☐ 5. Other Proposed	
SHORELAND ZONING ☐ Yes ☒ No					
DESIGN DETAILS (SYSTEM LAYOUT SHOWN ON PAGE 3)					
TREATMENT TANK ☒ 1. Concrete ☒ a. Regular ☐ b. Low Profile ☐ 2. Plastic ☐ 3. Other: _____ CAPACITY: <u>1,000</u> GAL		DISPOSAL FIELD TYPE & SIZE ☐ 1. Stone Bed ☐ 2. Stone Trench ☒ 3. Proprietary Device ☒ a. cluster array ☐ c. Linear ☒ b. regular load ☐ d. H-20 load ☐ 4. Other: _____ SIZE: <u>896</u> ☒ sq. ft. ☐ lin. ft.		GARBAGE DISPOSAL UNIT ☒ 1. No ☐ 2. Yes ☐ 3. Maybe If Yes or Maybe, specify one below: ☐ a. multi-compartment tank ☐ b. _____ tanks in series ☐ c. increase in tank capacity ☐ d. Filter on Tank Outlet	
SOIL DATA PROFILE <u>9</u> CONDITION <u>C</u> at Observation Hole # <u>TP-6</u> Depth <u>15</u> " of Most Limiting Soil Factor Groundwater		DISPOSAL FIELD SIZING ☐ 1. Medium---2.6 sq. ft. / gpd ☐ 2. Medium---Large 3.3 sq. f.t / gpd ☐ 3. Large---4.1 sq. ft. / gpd ☒ 4. Extra Large---5.0 sq. ft. / gpd		EFFLUENT/EJECTOR PUMP ☐ 1. Not Required ☐ 2. May Be Required ☒ 3. Required Specify only for engineered systems: DOSE: _____ gallons	
				DESIGN FLOW <u>174</u> gallons per day BASED ON: ☒ 1. Table 4A (dwelling unit(s)) ☐ 2. Table 4C (other facilities) SHOW CALCULATIONS — for other facilities — 5GPD/Seat *30 + 12GPD/Staff *2 = 174 ☐ 3. Section 4G (meter readings) ATTACH WATER METER DATA LATITUDE AND LONGITUDE at center of disposal area Lat. <u>N44</u> d <u>55</u> m <u>19.10</u> s Lon. <u>W68</u> d <u>41</u> m <u>1.68</u> s if g.p.s. state margin of error: <u>20</u>	
SITE EVALUATOR STATEMENT					
I certify that on <u>2/4/2025</u> (date) I completed a site evaluation on this property and state that the data reported are accurate and that the proposed system is in compliance with the State of Maine Subsurface Wastewater Disposal Rules (10-144A CMR 241).					
_____ Site Evaluator Signature		_____ 375 SE #		_____ 02/27/25 Date	
_____ Timothy J. Hodgins Site Evaluator Name Printed		_____ 207-356-2801 Telephone Number		_____ thodgins@wrcmaine.com Email Address	
Designed with SeptiCAD v5 Note: Changes to or deviations from the design should be confirmed with the Site Evaluator.					

SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION				Maine Department of Human Services Division of Health Engineering, Station 10 (207) 287-5672 Fax: (207) 287-3165	
Town, City, Plantation OLD TOWN		Street, Road, Subdivision COLLEGE AVENUE		Owner or Applicant Name UNIV. OF MAINE SYSTEM c/o R. RYAN WARD	
SITE PLAN Scale 1" = _____ ft.				SITE LOCATION PLAN N ↑	
SEE ATTACHED					
SEE ATTACHED					
NOTES: 1. This is not a survey. All property lines, building locations and site features have been approximately located, unless otherwise shown. 2. Septic tank and disposal field must be located at least 8' and 20' from a full foundation, respectively. 3. Septic tank and disposal field must be located at least 8' and 15' from a non-full foundation, respectively. 4. Proposed well must be located at least 50' from septic tank(s) and 100' from disposal field(s). 5. Scarify all ground to be filled. Remove vegetation and organic loam topsoil. Scarify soil to a depth of 6 to 8 inches by mixing gravelly coarse sand with native soil using a rototiller or a backhoe bucket with teeth. Do not use a backhoe bucket without teeth because it can compact and smear the underlying soil. 6. Insulate the Distribution Box (D-Box). 7. Min. 1/4"/ft (2%) pitch of pipe from building to septic tank. 8. A pump station is required, therefore a 2" Dia. pressure line shall connect the distribution box and the septic tank. Protect line from freezing or crushing. 9. This system is not designed to be used with a garbage disposal. 10. This system is not designed for backwash from a water softener.					
SOIL PROFILE DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)					
Observation Hole # <u>TP-6</u> ☒ Test Pit ☐ Boring <u><1</u> " Depth of organic horizon above mineral soil			Observation Hole # <u>TP-7</u> ☒ Test Pit ☐ Boring <u>1</u> " Depth of organic horizon above mineral soil		
Depth below mineral soil surface (inches)	0	Texture	Consistency	Color	Mottling
	6	Silt Loam	Friable	Dark Brown	None Observed
	12	Silt Loam	Friable	Olive Brown	
	18	Silt Loam to Silty Clay Loam	Firm	Olive Brown	Common & Distinct
	24	Refusal (Firm) at 24 inches			
	30				
	36				
	42				
	48				
	9	C	3	15"	☒ Groundwater ☐ Restrictive Layer ☐ Bedrock
Profile	Condition	Percent	Depth		
Observation Hole # <u>TP-7</u> ☒ Test Pit ☐ Boring <u>1</u> " Depth of organic horizon above mineral soil			Observation Hole # <u>TP-7</u> ☒ Test Pit ☐ Boring <u>1</u> " Depth of organic horizon above mineral soil		
Depth below mineral soil surface (inches)	0	Texture	Consistency	Color	Mottling
	6	Silt Loam	Friable	Dark Brown	None Observed
	12	Silt Loam	Friable	Olive Brown	
	18	Silt Loam to Silty Clay Loam	Firm	Olive Brown	Common & Prominent
	24	Refusal (Firm) at 29 inches			
	30				
	36				
	42				
	48				
	9	C	3	15"	☒ Groundwater ☐ Restrictive Layer ☐ Bedrock
Profile	Condition	Percent	Depth		
Site Evaluator Signature _____		375 SE #		02/27/25 Date	

SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION		Maine Department of Human Services Division of Health Engineering, Station 10 (207) 287-5672 Fax: (207) 287-3165
Town, City, Plantation OLD TOWN	Street, Road, Subdivision COLLEGE AVENUE	Owner or Applicant Name UNIV. OF MAINE SYSTEM c/o R. RYAN WARD
SUBSURFACE WASTEWATER DISPOSAL PLAN		Scale: 1" = <u>20</u> ft
SEE ATTACHED		
BACKFILL REQUIREMENTS Depth of Backfill (upslope) <u>28"</u> Depth of Backfill (downslope) <u>33" to 44"</u>	CONSTRUCTION ELEVATIONS Finished Grade Elevation (at Row 1) <u>-31"</u> Top of Chamber (at Row 1) <u>-43"</u> Bottom of Chamber (at Row 1) <u>-56"</u> Bottom of Stone (at Row 1) <u>--NA--</u>	ELEVATION REFERENCE POINT Location & Description: <u>TBM1 - Nail & Flagging 26"</u> <u>up 8" Oak</u> Reference Elevation: <u>0.0"</u>
DISPOSAL FIELD CROSS SECTION		Scales: Vertical: 1" = <u>5</u> Horizontal: 1" = <u>5</u>
SEE ATTACHED		
 Site Evaluator Signature	<u>375</u> SE #	<u>02/27/25</u> Date
		Page 3 of 3 HHE-200 Rev. 02/11

Existing Grade
Elevations
-59" -59"
-64" -75"
FIELD CORNERS

1/4"/ft (2%) 4" Dia.
Sch40 Solid PVC Pipe
From Building

Shoulder of Gravelly
Coarse Sand Fill
1000 Gallon Septic Tank
Certified Watertight w/Outlet
Filter and Risers to Grade

TBM1 - Nail & Flagging 26"
up 8" Oak

TBM2 - Nail & Flagging 26"
up 5" Hemlock



4' Dia. Manhole Style
Pump Station
Certified Watertight
w/Riser to Grade

2" Dia. Pressure Line
Protect from Freezing
or Crushing

D-Box Set
Level & Insulated

30"
FILL

25"
FILL

Toe of Fill Extension

B

A

183°

TP-6

TP-7

28'

15'

12'

23'

39'

12'

34'

50'

30'

25"

FILL

4" Dia. Solid PVC Pipe
Connecting Top of Chambers

Install Diversion Swale

41"
FILL

Depth of Fill
Required

14 - 4' x 8' Standard Load Side-Feed Concrete Chambers
With 1' of Stone Around Perimeter
2 x 7 units long (18' x 30')

**UNIVERSITY OF MAINE SYSTEM
HHE200 PAGE 3A DISPOSAL SYSTEM PLAN
PROPOSED CLASSROOM FACILITY
DEMERITT FOREST/COLLEGE AVENUE**

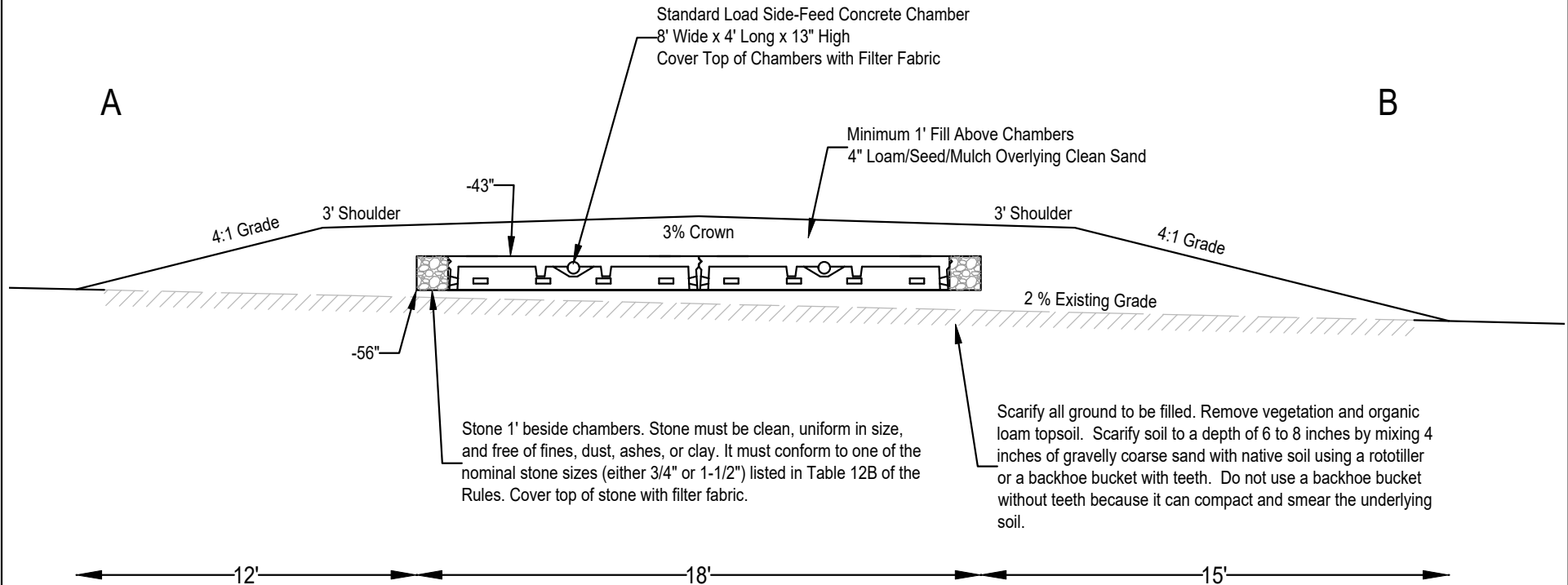
3A

SCALE:
1"= 20'

BY: TJH
DATE: 2/21/2025
PROJECT: 23069

WWW.WRCMAINE.COM
207-944-7288

NOTE: BACKFILL MATERIAL PLACED
BELOW OR WITHIN 3' OF THE CHAMBERS
OR STONE BESIDE CHAMBERS MUST BE
GRAVELLY COARSE SAND MEETING
SECTION 12(E)(2) OF THE RULES.
REMAINING FILL LOAMY SAND (NO CLAY).



UNIVERSTITY OF MAINE SYSTEM HHE200 PAGE 3B CROSS SECTION	3B	BY: TJH	WWW.WRCMAINE.COM 207-944-7288
		DATE: 2/21/2025	
PROPOSED CLASSROOM FACILITY DEMERITT FOREST/COLLEGE AVENUE	SCALE: 1"=5'	PROJECT: 23069	

INSTALLATION MAINTENANCE GUIDELINES FOR ON-SITE WASTEWATER TREATMENT SYSTEMS

OVERVIEW

This disposal system design (HHE-200) is intended to only represent facts pertinent to State of Maine subsurface wastewater disposal rules, Chapter 241 (Rules). The current version of the Rules is incorporated and made part of this HHE200 design and shall be consulted by the owner or owner's agent if additional information is needed. It shall be the responsibility of the owner or owner's agent to confirm all relevant setbacks and compliance with other applicable Federal, State and municipal rules. All information shown on HHE 200 forms relating to property lines and structures, such as; but not limited to; wells, cellar drains, cesspools, waterlines, septic tanks, utility lines, easements, etc., are based solely on information provided by the owner/owner's agent and should be confirmed prior to construction. These features are noted or not included based on whether or not they affect the disposal system design. It is the responsibility of the owner or owner's agent to confirm before construction begins the information as shown on the design that may affect the installation or operation of the disposal system as designed. If any deviation from design is encountered, contact designer immediately and cease all construction activities. The owner/applicant must investigate whether or not any additional requirements are needed (zoning, minimum lots sizes, municipal setbacks, etc.). It is the applicant's responsibility to obtain any local, State or Federal permits required for installation of the system.

To obtain a permit, take three copies of the HHE-200 form and supporting paperwork to the local plumbing inspector. It is recommended that you keep a back-up copy of your permit. If your application requires a variance, this must be submitted and approved before a permit can be issued.

HOW YOUR SEPTIC SYSTEM WORKS

An on-site wastewater disposal system is a complex physical, biological treatment system and depends on living organisms to function properly. The system will only function properly if it is designed, installed, and maintained correctly. Toxic or hazardous material can, in effect "kill" the system, as well as pollute local groundwater sources. Restricted chemicals and toxic substances like paint, thinner, photo developing solutions, non-biodegradable materials, and cooking greases must not be disposed in the system. NSF approved single ply bath tissues and low phosphorous detergents are recommended. Antibacterial soaps may also adversely affect system performance. Small amount of household cleaners are generally acceptable. Your septic system is designed to treat domestic effluent only. Any other source of water, such as roof runoff, foundation drains, and surface runoff should not enter into the system. The system is designed to treat a specific volume of water on a daily basis. Excess volume can cause premature failure. Some good practices include spacing out laundry loads throughout the week, using low flow fixtures, and fixing leaking fixtures. With proper care and maintenance systems typically last 15 to 20 years. Use of a garbage disposal is not recommended, unless specifically addressed in the HHE 200 form.

OVERVIEW OF A DISPOSAL SYSTEM

A septic system has two basic working parts; a septic tank to hold and pretreat effluent, and a disposal field to treat wastewater.

SEPTIC TANK: Wastewater flows from the house into the tank; here, heavy solids settle and are partially decomposed by anaerobic bacteria to form sludge. Lighter solids and greases float to the top forming a scum layer. The effluent is "pretreated" here in the tank; however, the rate of biological breakdown is slower than the rate of accumulation, resulting in a build-up of sludge in the tank. If solids build up to excessive levels, then they can be carried over into the disposal field. This causes the soil pores and pipes to become clogged and cause the system to fail. A schedule of regularly pumping out the tank sludge every three years or whenever the sludge and scum occupies $\frac{1}{3}$ of the tank's liquid capacity is recommended.

DISPOSAL FIELD: Depending on your specific design you may have any one of several types of disposal systems. They all function basically the same by providing a space for water to enter the soil. The partially treated wastewater from the septic tank enters the disposal field and is further purified by aerobic bacteria in a biological layer at the soil interface. The soil then filters out the remaining particles

and excess nutrients. This is the last line of defense against polluted water entering lakes and streams. To maintain your disposal field, avoid compacting the soil above it and do not allow any tree or large vegetation to become established. Underground roots exploit the open channels in the disposal system and can quickly plug up the field; causing premature failure. Avoid gardens and animal pens as well as any vehicular traffic, unless H2O ratings are specifically allowed in application form. It is important to slow erosion and infiltration to maintain vegetative cover, such as grass, over the system and fill area.

1. General Installation Notes (unless otherwise specified)

- a. System must be installed according to Maine Subsurface Wastewater Rules: 144A CMR 241 (Rules).
- b. Install all proprietary devices in accordance with manufacturer's recommendations.
- c. Contact designer if any deviation from design is encountered.
- d. Only install systems during suitable weather and moisture conditions.
- e. Do not install during wet weather or below freezing temperatures.
- f. Remove all vegetation and organic matter within system and fill extension area, leaving as much original topsoil as possible.
- g. Remove all trees within 10 feet of system and fill extension area.
- h. Divert any surface water from disposal system area.
- i. Fertilize, seed, and mulch all disturbed soils with (quantities per/1000 SF) 90 Lbs. Lime, 30 Lbs. of 10-10-10 fertilizer (or equivalent manure); seed with 3 Lbs. conservation mix or equivalent, mulch with 1.5 bales hay or straw. Alternatively use minimum of 6 inches of wood bark mulch and landscape as needed.

2. Setbacks Requirements for residential (<1,000 GPD): Unless Otherwise Noted

- a. Septic tank:
 - i. 100 feet from major water bodies;
 - ii. 50 feet from private wells, intermittent streams and minor water bodies;
 - iii. 25 feet from all drainage ditches;
 - iv. 8 feet from building; and
 - v. 10 feet from property lines.
- b. Disposal Area:
 - i. 300 feet from public water supply well, or 2,000 gpd usage;
 - ii. 100 feet from wells and major water bodies;
 - iii. 50 feet from intermittent streams and minor water bodies;
 - iv. 25 feet from all drainage ditches;
 - v. 15 feet from slab, 20 feet from full foundation; and
 - vi. 10 feet from property lines.

3. Septic Tank Installation

- a. Use precast concrete watertight tank unless otherwise specified.
- b. Building sewer lines to slope ¼ inch per foot minimum.
- c. Seal all holes and pipe openings to create watertight tank.
- d. Bed septic tank in 6 inches of clean gravel, unless otherwise noted on plans.
- e. Install Outlet filter (Zabel A-100 or equivalent).
- f. Inspection covers and cleanouts to be sealed in areas with high water table.
- g. Record location of covers with swing ties.
- h. Install Risers to grade to assist in maintenance/inspection.

4. General Disposal Area Installation:

- a. Disposal area and/or distribution lines are to be level across each row (+/- 1" in 100').
- b. Do not operate wheeled equipment on disposal area or fill extension.
- c. Scarify or rototill disposal area bottom and fill extension along contour, avoid smearing or compacting native soil.
- d. Mix a minimum of 6 inches of fill with native soil if fill is coarser in texture to improve percolation.
- e. All fill beneath and beside system to be coarse sand to gravelly coarse sand as outlined in the Rules.
- f. Fill above system to be sandy loam or coarser.
- g. Minimum of 4 inches of topsoil suitable for establishing vegetative cover.
- h. Finished grade of disposal system area and foot shoulder to be crowned 3%.
- i. Fill extension to be slopes at 25% minimum unless otherwise noted.
- j. Grade surrounding area and upslope to deflect groundwater from system.

- k. Distribution boxes (D-Box) to be set level and placed on firm surface with flow equalizers on outlets.
 - l. Cover D-Box on sides and top with 2 inches high density rigid polystyrene insulation to keep from freezing.
- 5. Stone and Pipe System**
- a. Install minimum 12 inches clean, washed stone, uniform in size $\frac{3}{4}$ to $1\frac{1}{2}$ inches in diameter.
 - b. All bed area and pipes to be level and installed at design elevation.
 - c. Cover stone with suitable filter fabric before backfilling system.
 - d. Effluent pipe to disposal field to slope $\frac{1}{8}$ inch per foot minimum.
 - e. All 90° turns to use 45° or 22.5° degree sweeps.
- 6. Proprietary Devices**
- a. Install all proprietary devices as per manufacturer's instructions.
 - b. Equivalent devices may be substituted if approved by Site Evaluator.
- 7. Pump Systems**
- a. Prepackaged pump stations where available:
 - i. Pump: contractor to size pump according to lift and run if not otherwise specified; and
 - ii. Install check valve and high water alarms in accordance w/ manufacturer's recommended installation.
 - b. Insulate effluent line and D box with 2" high density rigid polystyrene insulation if cover is less than 5 feet. 2" foam has insulation value of approximately 18 "of earth cover. Maintain a minimum of 12" of cover over effluent line.
 - c. Install velocity reducer or "Tee" fitting on effluent line outlet in D-Box.
- 8. Erosion Control Notes**
- a. All sedimentation and erosion control measures shall be in accordance with the current edition of the MDEP Maine Erosion and Sediment Control BMPS.
 - b. Silt fence will be inspected, replaced, and/or repaired immediately following any significant rainfall or snow melt or loss of serviceability due to sediment accumulation. At a minimum, all erosion control devices will be observed weekly.
 - c. During the construction phase, intercepted sediment will be returned to the site and regraded onto open areas.
 - d. Sediment control devices shall remain in place and be maintained by the contractor until upslope areas are stabilized by a suitable growth of grass. Once a suitable growth has been obtained, all temporary erosion control items shall be removed. Any sediment deposits remaining in place after they are removed shall be dressed to conform to the existing grade; prepared, seeded, and mulched immediately.
 - e. All disturbed areas will be seeded and mulched.
- 9. Care and Maintenance Recommendations**
- a. Avoid any traffic or snow removal over pipes and disposal system unless specifically allowed in the system design.
 - b. Pump out and inspect septic tank every three years.
 - c. Minimize water use through low flow fixtures.
 - d. Use of garbage disposal devices is not recommended. If one is used, increase size of septic tank to next larger size or install a second tank in series.
 - e. Maintain vegetative cover over system and avoid compaction of topsoil.
 - f. Remove any woody vegetation that seeds-in within area or fill extensions.
 - g. Restricting laundry use (two loads/day rather than bunching several loads in one day) is recommended. Washers use large amounts of water and several uses in one day may exceed the design flow of your septic system and cause premature septic system failure.
 - h. Wipe out oils and grease from cooking pans with paper towels and dispose in the trash. Grease and oils float and may clog the leach field.
 - i. Do not put feminine napkins or tampons in the septic system.
 - j. Always use single ply toilet paper with a septic system.
 - k. Do not use excessive amounts of antibacterial soaps, or household cleansers bleach, etc.; these can kill the natural bacteria in the septic tank and severely reduce the effluent treatment.



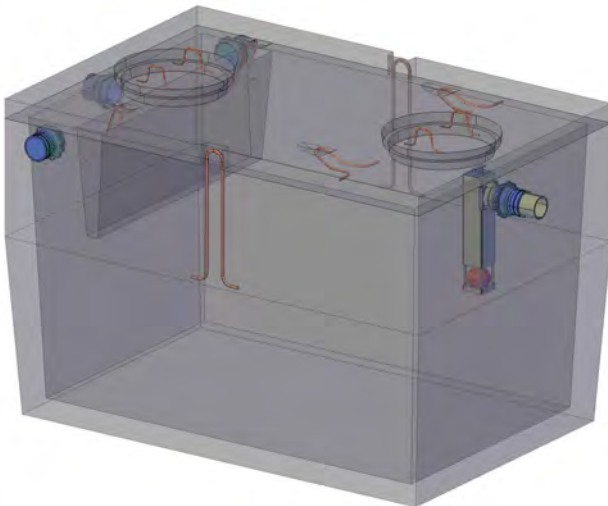
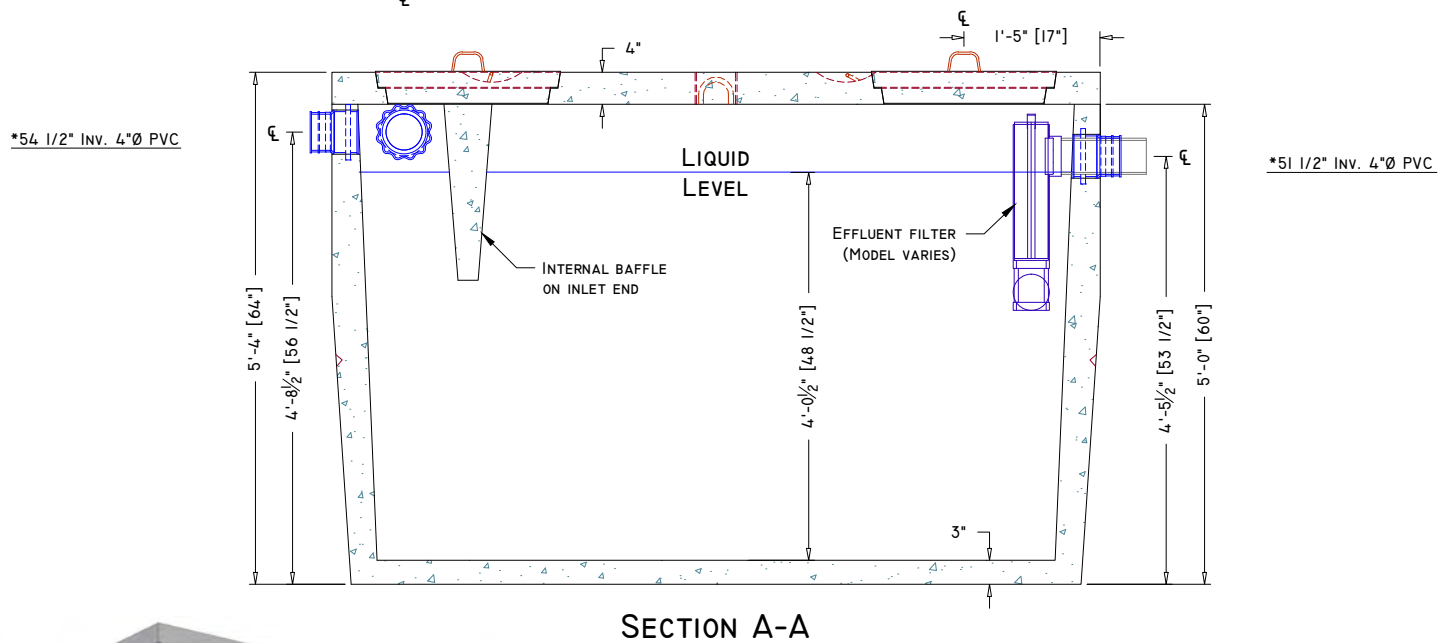
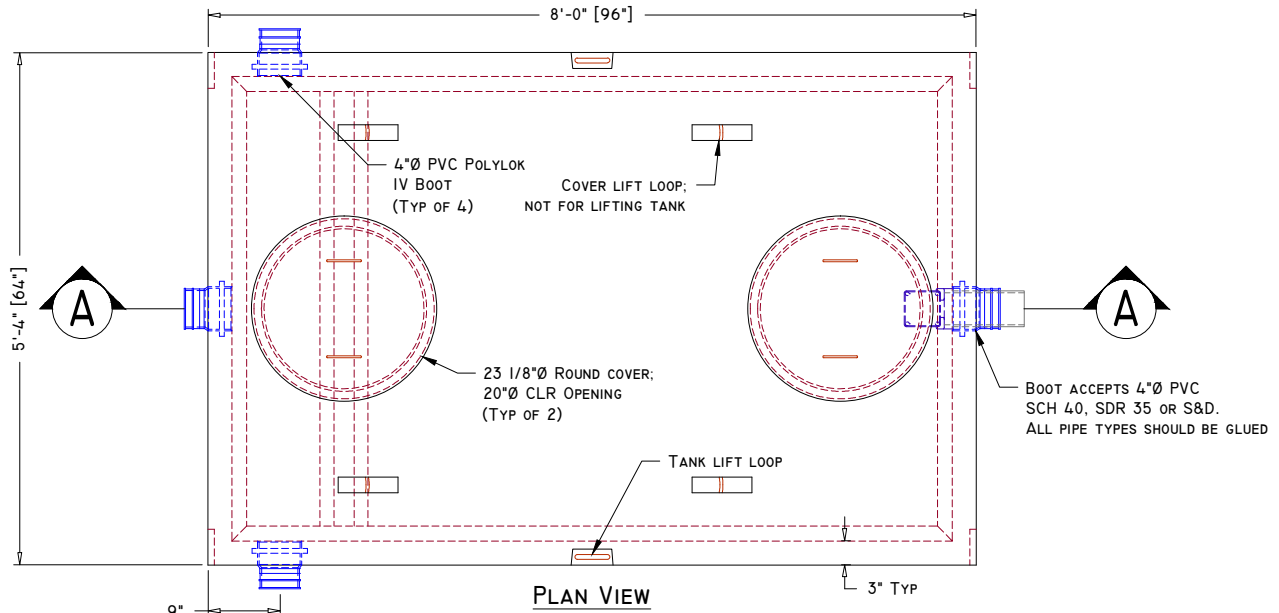
American Concrete Industries

1000 GALLON REGULAR SEPTIC TANK

ACI CATALOG 2014 / 1000 GALLON TANKS

RESIDENTIAL TANKS

ITEM# 2039



CONCEPTUAL VIEW
SCALE: NTS

*Dimension is taken from bottom of tank

Manufacturing Notes

- 1.1. CONCRETE COMPRESSIVE STRENGTH: 5000PSI @ 28 DAYS
- 1.2. AIR ENTRAINMENT: 4-6%
- 1.3. GRADE 60 REINFORCEMENT
- 1.4. STRUCTURAL FIBER REINFORCED BASE
- 1.5. TANKS SHOULD BE PUMPED EVERY 3-5 YEARS, DEPENDING ON USE
- 1.6. NEVER USE SEPTIC CLEANING AGENTS
- 1.7. DESIGNED FOR PEDESTRIAN LOAD RATING ONLY
- 1.7.1. SPECIFY H20 FOR BURIAL DEPTHS > 5'
- 1.8. ALL TANK PENETRATIONS ARE INTEGRALLY CAST
- 1.9. ALL JOINTS SEALED W/ BUTYL RUBBER JOINT SEALANT

Physical Specifications:

Cover Weight:	2,575 lbs
Tank Weight:	7,015 lbs
Total Weight:	9,590 lbs
Available Capacity:	1,194 gal (max) W/O Baffle
Working Capacity:	994 gal (4"Ø PVC) W/ Baffle

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1717 STILLWATER AVE. 1022 MINOT AVE.
VEAZIE, ME 04401 AUBURN, ME 04210

TEL: (207) 947-8334 | FAX: (207) 947-3580

TEL: (207) 784-1388 | FAX: (207) 783-4039

SCALE: 1/2" = 1'-0" UNLESS OTHERWISE NOTED

DRAWN DATE: 11/11/2014

SSM

REVISION #:

REVISION DATE: Page 10 of 13



	MODEL	ITEM #	HP	(V)	TDH RANGE	SHUTOFF
EFFLUENT	253	351010	0.3	115	<13'	23'
	283	351060	0.5	115	14'-27'	37'
	280HV	351022	0.5	230	14'-27'	37'
	293	351105	0.75	115	28'-38'	47'
	293HV	351110	0.75	230	28'-38'	47'
	FL51M	351120	0.5	115	39'-45'	55'
	FL52M	351140	0.5	230	39'-45'	55'
	FL62M	351180	0.6	230	45'-55'	65'
	FL72M	351200	0.75	230	55'-63'	77'
	FL102M-2	351220	1	230	63'-75'	90'
SOLIDS HANDLING	FL152M-2	351240	1.5	230	75'-90'	110'
	FL202M-2	351260	2	230	90'-120'	130'
	LE51A	351275	0.5	115	<18'	24'
	LE52M	351300	0.5	230	<18'	24'
	LE71M2	351320	0.75	115	18'-23'	29'
	LE72M2	351340	0.75	230	18'-23'	29'
	LE102M2	351344	1	230	23'-31'	38'
	LEH102M2	351350	1	230	31'-43'	53'
	LEH152M2-2	351352	1.5	230	43'-63'	70'
	LEH202M2-2	351360	2	230	63'-75'	82'
GRINDER	PRG101M	351380	1	115	<36'	51'
	PRG102M	351400	1	230	<36'	51'
	LSG202M*	351420	2	230	37'-90'	110'
	LSGX202M*	351480	2	230	91'-151'	184'

*LSG REQUIRE - G90 Elbow (342640)

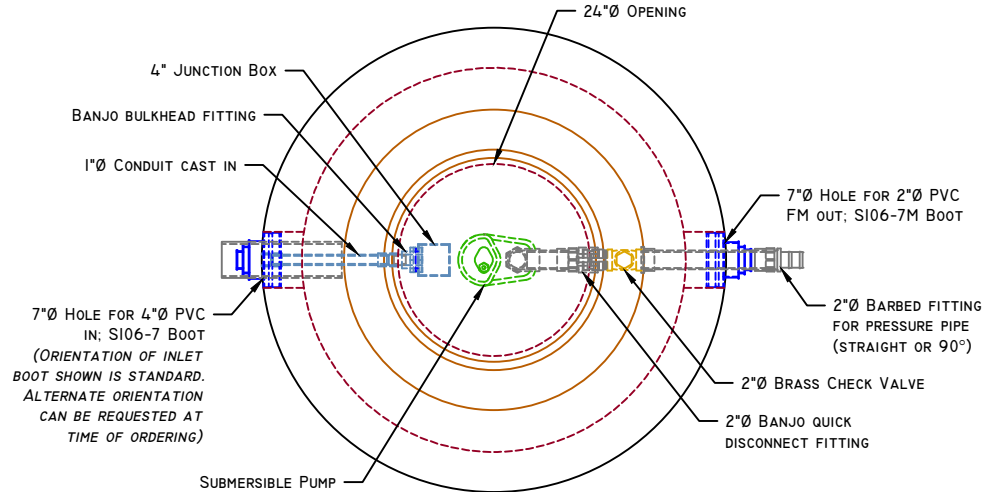
*LSG REQUIRE - G90 ELBOW (342640)

Manufacturing Notes

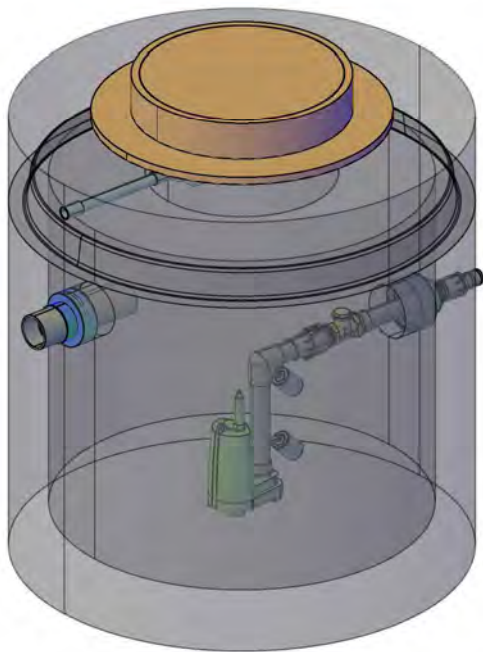
- 1.1. CONCRETE COMPRESSIVE STRENGTH: 4000PSI @ 28 DAYS
- 1.2. AIR ENTRAINMENT: 4-6%
- 1.3. GR. 60 STEEL & STRUCTURAL FIBER REINFORCED
- 1.4. NEVER USE SEPTIC CLEANING AGENTS
- 1.5. DESIGNED FOR H20 WHEEL LOAD RATING
- 1.6. ALL JOINTS SEALED W/ BUTYL RUBBER JOINT SEALANT
- 1.7. LIFT/PUSH/PUMP STYLE INFORMATION REQUIRED AT TIME OF ORDERING

Physical Specifications:

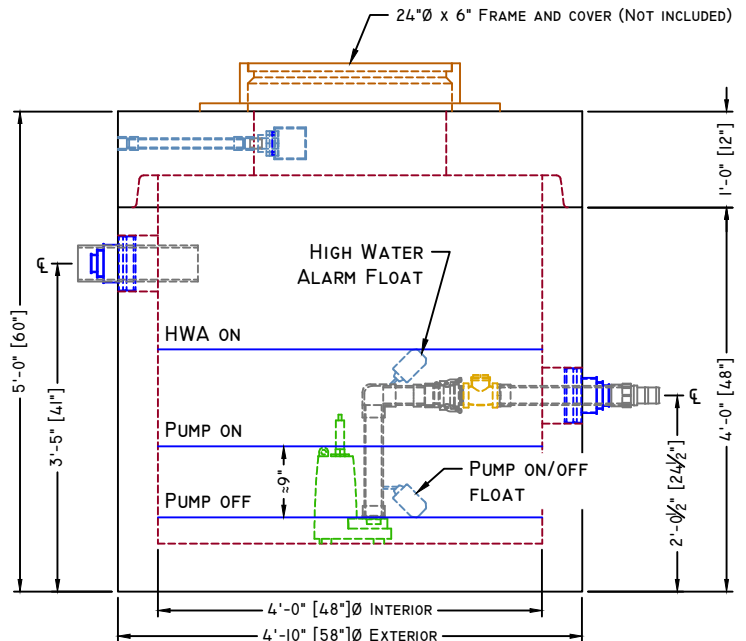
COVER WEIGHT: 1,670 LBS
BASE WEIGHT: 4,515 LBS
Total Weight: 6,185 lbs
HWA CAPACITY: ~188 GAL
Dosing Capacity: 70 gal (average)
TANK 'FULL' CAPACITY: 377 GAL



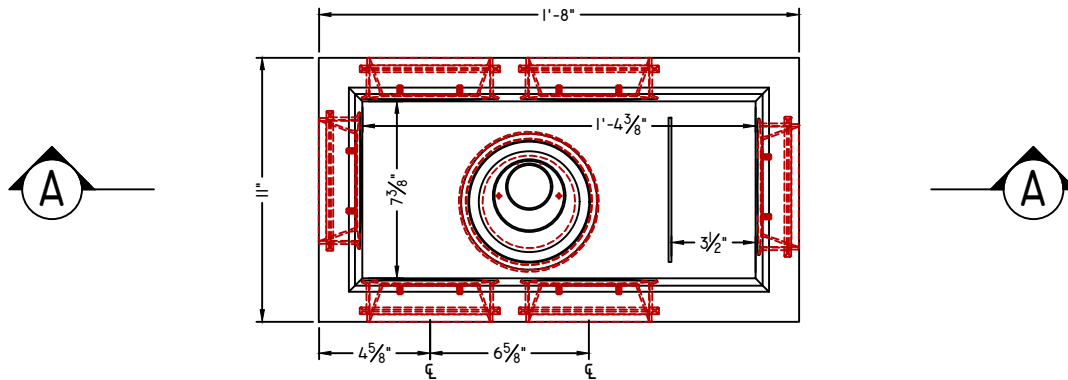
PLAN VIEW



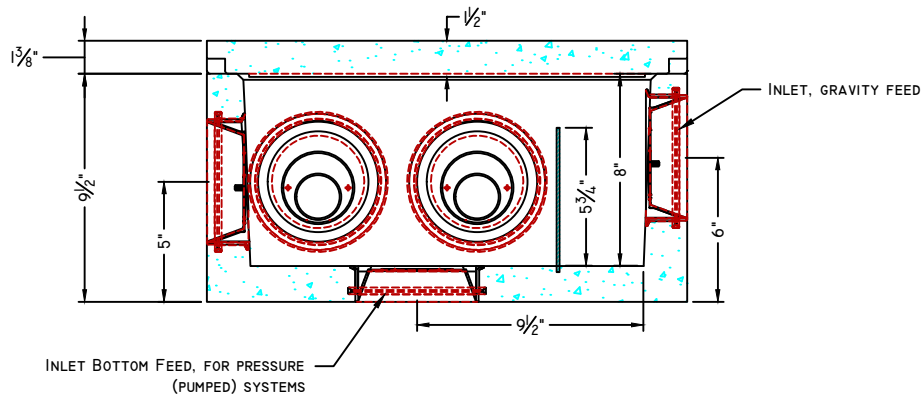
CONCEPTUAL VIEW - NTS



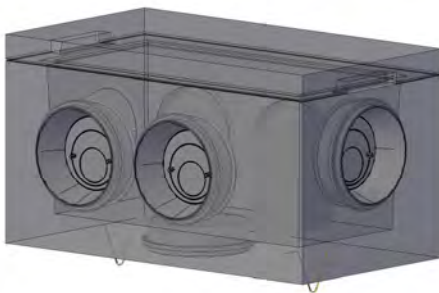
ELEVATION VIEW



PLAN VIEW
(WITHOUT COVER)



SECTION A-A



CONCEPTUAL VIEW

SCALE: NTS

Manufacturing Notes

- 1.1. CONCRETE COMPRESSIVE STRENGTH: 4,000PSI @ 28 DAYS
- 1.2. AIR ENTRAINMENT: 4-6%
- 1.3. GRADE 60 REINFORCEMENT & STRUCTURAL FIBER REINFORCED
- 1.4. NEVER USE SEPTIC CLEANING AGENTS
- 1.5. DESIGNED FOR PEDESTRIAN LOAD RATING ONLY
- 1.6. ALL PIPE SEAL PENETRATIONS ARE INTEGRALLY CAST
- 1.7. FLOW EQUALIZERS RECOMMENDED FOR EQUAL BED LOADING

Physical Specifications:

Cover Weight:	27 lbs
Base Weight:	73 lbs
Total Weight:	101 lbs



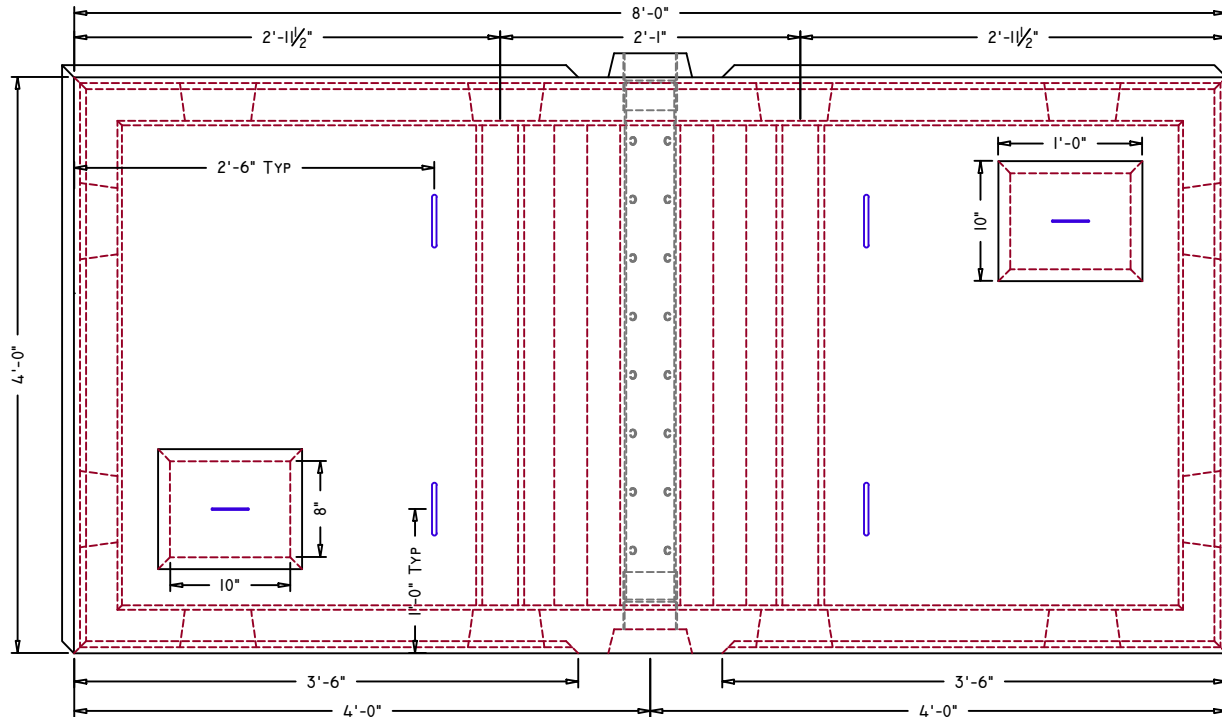
American Concrete Industries

4'x8' SIDE FEED FLOWDIFFUSOR

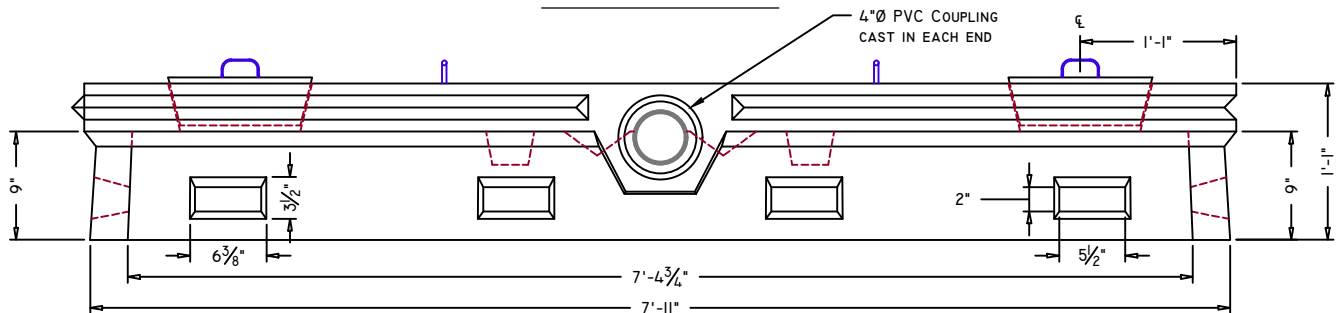
ACI CATALOG 2014 / FLOWDIFFUSORS

RESIDENTIAL SEPTIC LEACHING PRODUCTS

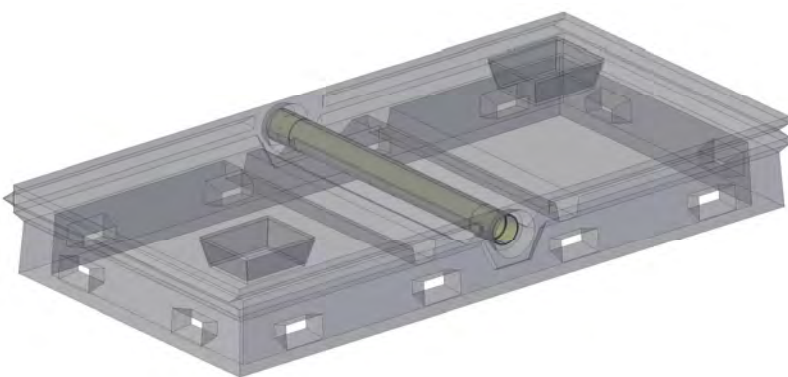
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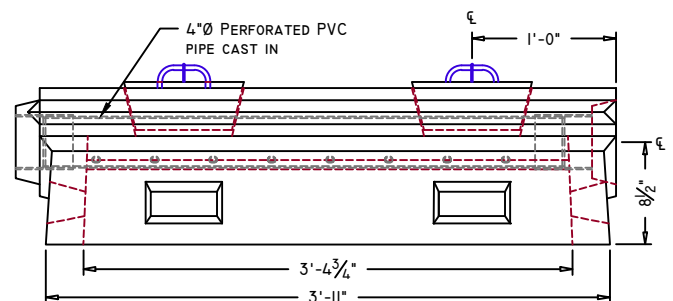
PLAN VIEW



ELEVATION VIEW



CONCEPTUAL VIEW - NTS



END VIEW

Manufacturing Notes

- 1.1. CONCRETE COMPRESSIVE STRENGTH: 5000PSI @ 28 DAYS
- 1.2. AIR ENTRAINMENT: 4-6%
- 1.3. GRADE 60 REINFORCEMENT
- 1.4. DESIGNED FOR PEDESTRIAN LOAD RATING ONLY
- 1.4.1. SPECIFY H20 FOR BURIAL DEPTHS > 5'

Physical Specifications:

Weight: 2,225 lbs

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1717 STILLWATER AVE. 1022 MINOT AVE
VEAZIE, ME 04401 AUBURN, ME 04210

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SCALE: 3/4" = 1'-0" UNLESS OTHERWISE NOTED

DRAWN DATE: 11/07/2014

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REVISION #: 0.01 Page 13 of 13

REVISION DATE: 12/13/2017