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</table>
Montana State University - New Dining Hall
Bid Packages: Shell Bid      PPA A/E #15-0103

GENERAL CONTRACTOR/CONSTRUCTION MGR.
LANGLAS & ASSOCIATES
1019 East Main
Bozeman, MT 59716
(406) 585.3420  Contact: Roger Davis, rDavis@langlas.com

ARCHITECT
MOSAIC ARCHITECTURE, P.C.
428 North Last Chance Gulch
Helena, MT 59601
Ph. 406-449-2013  Contact: Matt Aune, mAtt@mosaicarch.com  Jeff Downhour, jeff@mosaicarch.com

CIVIL ENGINEER
TD&H ENGINEERING
234 East Babcock
Bozeman, Montana 59715
Ph. 406-586.0277  Contact: Ahren Hastings  Ahren.hastings@tdhengineering.com

STRUCTURAL, MECHANICAL/PLUMBING, ELECTRICAL ENGINEERING
MORRISON MAIERLE, INC.
2880 TECHNOLOGY BLVD. WEST
P.O. BOX 1113
BOZEMAN, MT 59771-1113
(406) 587-0721  Structural Contact: Brian Aschim  baschim@m-m.net  Mechanical contact: Erik Renna, erenna@m-m.net  Electrical Contact: Ryan Maroney  rmaroney@m-m.net

LANDSCAPE ARCHITECT
CIVITAS
1200 BANNOCK ST.
DENVER, CO 80204
Ph. 303-571-0053  Contact: Robin Rooney  rooney@civitas.com

PROJECT NOTICES

PERMITTING
See General Requirements from GCCM for permitting requirements. Mechanical and Electrical subcontractor to obtain permits for that portion of work and include cost in bids.

MONTANA PUBLIC WORKS STANDARD SPECIFICATIONS
The 2014 Montana Public Works Standard Specifications are hereby incorporated into this document.

SOILS REPORT
There is a soils report available for the project included in the project manual.
INVITATION FOR BIDS
Montana State University New Dining Hall – Site & Structure
Montana State University Campus
Bozeman, MT

RECEIPT OF PROPOSALS
Sealed bids will be received by Montana State University (MSU) and Langlas and Associates at 1019 E. Main St. Suite 101 Bozeman, MT 59715 no later than 2 pm on Thursday, November 17th, 2016. The bids will be reviewed by Langlas and Associates and MSU in accordance with the Specifications and the Contract Documents prepared by Mosaic Architecture. The scopes of work being bid at this time are Site/Civil, Concrete, and Structural Steel Supply & Installation.

A pre-bid walkthrough of the project will be held at 11:00 AM on Tuesday, November 8th, 2016 at the project site, located between the north side of the Chem/Biochem Building and Harrison Street. All bidding sub-contractors are strongly encouraged to attend. Bids shall be submitted on the form provided with the Contract Documents and in accordance with the "Instructions to Bidders” in the Contract Documents.

OBTAINING CONTRACT DOCUMENTS
On Friday, October 28th, 2016, bidding documents will be on file at Montana plans exchanges as listed in the “INSTRUCTIONS TO BIDDERS” and physical sets may be obtained on October 31st, 2016, at Langlas and Associates office located at 1019 E. Main Street Suite 101, Bozeman, MT (406) 585-3420 upon deposit of $100.00 per set. Plans are also available at www.langlas.com. The password can be obtained by contacting Langlas. Please ask for Matt Drake or Roger Davis for plan information.

Documents remain the property of the Architect and must be returned. Full refund of deposit will be made for complete sets that are returned in acceptable condition: without notes, marks, or mutilations, and within 15 calendar days after the opening of proposals. Plan holders that do not submit a proposal will forfeit their deposit.

PROPOSAL GUARANTEE
Bid Package Bids do not need to be accompanied by bid security. A performance and payment bond may be required before contract award. Please fill out the bid form correctly to include the additional amount for a performance and payment bond. If the Proposal is accepted, the Bidder may be asked to execute the Contract and fill acceptable Performance and Labor & Material Payment Bonds no later than ten (10) days after the Award of the Contract.

OWNER RIGHTS RESERVED
Montana State University, hereinafter called the Owner, reserve the right to reject any or all proposals and to waive any formality or technicality in any proposal in the interest of the Owner.

END OF INVITATION FOR BIDS
INSTRUCTION TO BIDDERS

All Bidders interested in supplying product for, and/or performing work on the MSU NEW DINING HALL – Site & Structure Bid Package, located in Bozeman, Montana, shall be subject to the requirements contained within the collective Bid Documents, which are outlined below.

1. Bid Addenda, if any.
2. Instructions to Bidders
3. General Requirements
4. Individually Numbered Bid Package Scopes, Instruction to Bidders, Bid Form, and General Requirements
5. Plan Drawings, prepared by Mosaic Architects, dated 10/26/16.
6. Specifications, prepared by Mosaic Architects, 10/26/16.

The designation of responsibility in the scopes of work takes precedence over the designation of responsibility on the drawings or specifications. If any conflict exists between these documents, precedence shall be determined by the order in which they are listed above. For example, if a conflict exists between the Plans and Specifications, Bidder is to follow the Specifications and include such requirements in his/her bid, unless requirements are altered by subsequent Bid Addenda issued during the bidding process.

Complete Bid Documents may be obtained at the Bozeman Builders Exchange and also at:

Langlas & Associates
1019 E. Main St. Suite 101
Bozeman, MT 59715

Complete Bid Documents may be viewed at the following locations as well:

Billings, MT Plans Exchange  Helena, MT Plans Exchange
406-652-1311     406-442-4162
Bozeman, MT Plans Exchange  Kalispell, MT Plans Exchange
406-586-7653     406-755-5888
Butte, MT Plans Exchange  Missoula, MT Plans Exchange
406-782-5433     406-549-5002
Great Falls, MT Plans Exchange  Bozeman Builders Exchange
406-453-2513  1105 Reeves Rd. W.
Bozeman, MT 59718
406-586-7653

During the bidding phase, all questions concerning the project, Bid Documents, bidding process, scope related items, plan discrepancies, pre-bid Requests for Information, product substitutions, etc. shall be directed to the Construction Manager designated. Do not contact TD&H or their Consultants with any questions during the bid process for any reason.

Langlas & Associates
Roger Davis, Senior Project Manager
1019 East Main Street, Suite #101
Bozeman, MT 59715
Ph. 406-585-3420     Fax 406-585-4110
E-mail: rdavis@langlas.com
Bidders shall submit all questions to Construction Manager in writing via fax or email. Questions will be answered in a timely manner, and may be used to generate Bid Addenda for distribution to all Bidders at the discretion of the Construction Manager, Owner and Design Team. Oral, telephonic, or other form of communication other than a formal Bid Addenda shall not be construed as to alter the Bid Documents.

**PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS**

A. Where the Bid Documents stipulate a particular product, substitutions will be considered up to 5 days before receipt of bids.

B. When a request to substitute a product is made, Architect may approve the substitution and will issue an Addendum to known bidders.

C. The submission shall provide sufficient information to determine acceptability of such products. Substitution request shall clearly indicate any deviation from specifications for substituted item.

D. Provide complete information on required revisions to other work to accommodate each proposed substitution.

E. Provide products as specified unless substitutions are submitted in this manner and accepted. Bidding products not specified or not formally approved as substitutions is done solely at the risk of the bidder.

Sealed bids for all scopes of work on this project shall be submitted on the Bid Form(s) provided within this package and are due no later than November 17th, 2016 at 2:00 pm MDT at Langlas & Associates Office at 1019 E. Main St. Suite 101 Bozeman, MT 59715. Bids shall be delivered by U.S. Mail, commercial carrier, or by hand to the address shown above and shall be clearly marked as follows:

Bidders Name and Address
Project: Montana State University New Dining Hall – Bozeman, MT
Address: Langlas & Associates
C/O Montana State University
1019 E. Main St. Suite 101
Bozeman, MT 59715

Bid Date: {insert bid date according to this publication or subsequent addendum}
Bid Package: {insert applicable Bid Package Number(s)}

Bids submitted on any form other than the one(s) provided within this package will be rejected.

Faxed bids will not be accepted. Faxed modifications to previously received sealed bids are acceptable, may be sent to (406) 585-4110, and shall clearly state the same information as shown above, in addition to indicating Bidders additive or deductive modification to the previously submitted bid. Do not indicate total bid amount on faxed modifications. Faxed modifications need to be received 5 minutes prior to bid time. Bidders are responsible for receipt of fax and ensuring fax modification is received and accepted.

Bids shall remain valid for a period of sixty (60) days following the Bid Date and may not be revoked during this time.

Bids will be opened and read aloud in the presence of the Construction Manager, Owner, and Architect. Tabulated bid results will be available as soon as possible and will be posted at the office of the Construction Manager and MSU.

Bids will be evaluated on the basis of the information requested on the Bid Form(s) as well as a post-bid scope and qualifications review by the Construction Manager following tabulation of the bid results. Construction Manager shall make recommendations to the Owner whether or not to accept bids from the apparent low bidders for each bid package depending upon Construction Manager’s findings during the qualification process. In the event that Construction Manager recommends against accepting an apparent low bid based on substantiated information and/or Owner elects not to accept such bid, the second bidder will be contacted for scope and qualification review. Such process shall continue until a qualified subcontractor/supplier is recommended by Construction Manager and/or accepted by Owner.
The CM and Owner may make such investigations as they deem necessary to determine the ability of the Bidder to perform the work, and the Bidder shall furnish all such information and data for this purpose as may be requested. The CM and the Owner reserve the right to reject any proposal if the evidence submitted by, or the investigation of, such Bidder fails to satisfy the CM and/or the Owner that such Bidder is properly qualified to carry out the obligations of the Subcontract and complete the work contemplated therein.

The CM and the Owner reserve the right in awarding subcontracts to consider the competency, responsibility, and suitability of the Bidder, as well as the amount of the proposals.

The CM and the Owner also reserve the right to reject any or all proposals, or waive any irregularities or informalities in the proposals received.

The CM will designate a set of documents as the record documents (as-built drawings) to be kept on-site. Any changes in work that deviate from the Contract Documents will be expected to be recorded on this set of Documents by the Subcontractor responsible for the scope of work affected. Any changes that the Subcontractor makes that vary from the Contract Documents shall be recorded within a Seventy-two (72) hour period after the change occurs in the field, by the Subcontractor, on the above mentioned Record Documents. The Record Documents will be reviewed weekly by the CM for compliance to this Article. If Documents are not being kept up to date, CM reserves the right to withhold progress payments and/or final payment to the Subcontractor, until the change(s) is (are) recorded in the Record Set of Documents.

The CM shall promptly pay each Subcontractor/Supplier, upon receipt of payment from the Owner, out of the amount paid to the CM on account of such Subcontractor’s/Supplier’s work, the amount to which said Subcontractor/Supplier is entitled. The CM requires each Subcontractor/Supplier to make prompt payments to its 2nd Tier Subcontractors or Suppliers in a similar manner. Joint check agreements may be used and can be accommodated by the CM. Progress and final payment to the Subcontractor/Supplier will only be processed upon receipt of a properly executed pay request from the Subcontractor/Supplier, on the CM’s “Subcontractor’s request for payment, certificate and interim waiver of claim and lien” form (Attached). This pay request must be received by the CM on or before the 25th of the month. Applications received after the 25th of the month will be held unprocessed until the following pay period.

Prior to commencing work, Subcontractor shall furnish and thereafter maintain certificates of insurance in accordance with the requirements. Certificates of insurance and the policies represented thereby shall not be cancelled or modified until thirty (30) days after written notice has been given to CM of such cancellation or modification. Required coverage’s shall be maintained without interruption from the date the Subcontractor commences work on the Project until no sooner than the date of the Subcontractor’s receipt of final payment.
ADDITIVE ALTERNATE(S): The following additive alternates are an integral part of this proposal, and to be responsive, the bidder shall quote for the Base Bid, and an additive alternate (s) bid for the following listed items. The owner reserves the right to modify the contract, by Change Order, to include any and/or all Alternates at the value stated on the Contractors Bid Proposal within 90 calendar days of the date on the Notice to Proceed. See Specification Section 01 2300 Alternates for a complete description of each additive alternate.

Alternate #1: Roofing Membrane

**Base Bid:** Lower roof area west of Grid 3 to be bid as Hypalon (or KEE) roof membrane system. Remainder of roof, upper roof, deck area, and canopies, to be PVC membrane system. See ROOF BID ALTERNATE PLAN in drawings.

**Alternate Bid:** All roofing membrane to be bid as Hypalon (or KEE) roof membrane system.

Alternate Bid Amount (cost over Base Bid): $____________________(in NUMERIC notation), ___________________________________________________________ (in ALPHA notation)

Alternate #2: Added Roof Pavers

**Base Bid:** Mezzanine level east roof to be a combination of roof paver system on south end and washed river rock cover on north end as shown on mezzanine level plan.

**Alternate Bid:** Entire mezzanine level roof deck to be roof paver system.

Alternate Bid Amount (cost over Base Bid): $_____________________(in NUMERIC notation), ___________________________________________________________ (in ALPHA notation)

Alternate #3: West Elevation Siding

**Base Bid:** Siding on west elevation from grid B to grid E.3 from 100'-0” to 113'-0” A.F.F. to be PVFD finished standing seam metal siding.

**Alternate Bid:** Replace standing seam siding with flat Corten (A606 steel) panels with sub-girt system, trim, flashing and fasteners to match flat Corten siding on north and east elevations.
Alternate #3: East Glazing

**Base Bid:** All glazing to be Solarban 70XL as specified (or approved equal).

**Alternate Bid:** Replace Solarban 70XL with Electrochromic Tintable Glass as specified in 08 8836.21 in the following curtainwall and storefront sections: CW1, CW2, CW4, CW5, SF1, SF12, and SF21. Total area approximately 2,650 square feet. Bid to include glass, internal wiring, frame cables, terminal box, wiring from terminal box to controller (in upper level mechanical room), light sensors (assume 6), and manual switches (assume 6), controller panel, set-up, software and other components required for a complete system. Bid does NOT include providing conduit for control wiring or power to the controller panel/unit.

Alternate Bid Amount (cost over Base Bid) :$ ______________________ (in NUMERIC notation),
_________________________________________________________ (in ALPHA notation)
Bid Bond

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<td>(Name, legal status and principal place of business)</td>
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<td>(Name, location or address, and Project number, if any)</td>
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<td>« sample 310 »</td>
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The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension beyond sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety’s consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor’s bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Owner.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.
Signed and sealed this « » day of « », « »

(Contractor as Principal) (Seal)

(Title)

(Surety) (Seal)

(Witness) (Title)
**AIA® Document A312™ – 2010**

**Performance Bond**

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<th><strong>SURETY:</strong> (Name, legal status and principal place of business)</th>
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| **OWNER:** (Name, legal status and address) |
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(Any additional signatures appear on the last page of this Performance Bond.)

**FOR INFORMATION ONLY — Name, address and telephone**

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| **OWNER’S REPRESENTATIVE:** (Architect, Engineer or other party:) |
| « » « » « » « » « » |

**ADDITIONS AND DELETIONS:**

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An Additions and Deletions Report that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

**ELECTRONIC COPYING** of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.
§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety’s obligation under this Bond shall arise after

.1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor’s performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner’s notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety’s receipt of the Owner’s notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner’s right, if any, subsequently to declare a Contractor Default;

.2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

.3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety’s obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety’s expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner’s concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.
§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
.2 additional legal, design professional and delay costs resulting from the Contractor’s Default, and resulting from the actions or failure to act of the Surety under Section 5; and
.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety’s liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.
§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL
Company: (Corporate Seal)
Signature: 
Name and Title: « »
Address: « »

SURETY
Company: (Corporate Seal)
Signature: 
Name and Title: « »
Address: « »
AGREEMENT made as of the «  » day of «  » in the year «  »  
(In words, indicate day, month and year.)

BETWEEN the Owner: 
(Name, legal status and address)

and the Construction Manager: 
(Name, legal status and address)

for the following Project: 
(Name and address or location)

The Architect: 
(Name, legal status and address)

The Owner’s Designated Representative: 
(Name, address and other information)

The Construction Manager’s Designated Representative: 
(Name, address and other information)

The Architect’s Designated Representative:

ADDINGS AND DELETIONS: 
The author of this document has added information needed for its completion. 
The author may also have revised the text of the original AIA standard form. 
An Additions and Deletions Report that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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

AIA Document A201™–2007, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.
The Owner and Construction Manager agree as follows.
TABLE OF ARTICLES

1 GENERAL PROVISIONS
2 CONSTRUCTION MANAGER’S RESPONSIBILITIES
3 OWNER’S RESPONSIBILITIES
4 COMPENSATION AND PAYMENTS FOR PRECONSTRUCTION PHASE SERVICES
5 COMPENSATION FOR CONSTRUCTION PHASE SERVICES
6 COST OF THE WORK FOR CONSTRUCTION PHASE
7 PAYMENTS FOR CONSTRUCTION PHASE SERVICES
8 INSURANCE AND BONDS
9 DISPUTE RESOLUTION
10 TERMINATION OR SUSPENSION
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12 SCOPE OF THE AGREEMENT

ARTICLE 1 GENERAL PROVISIONS
§ 1.1 The Contract Documents
The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to the execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract and are as fully a part of the Contract as if attached to this Agreement or repeated herein. Upon the Owner’s acceptance of the Construction Manager’s Guaranteed Maximum Price proposal, the Contract Documents will also include the documents described in Section 2.2.3 and identified in the Guaranteed Maximum Price Amendment and revisions prepared by the Architect and furnished by the Owner as described in Section 2.2.8. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. If anything in the other Contract Documents, other than a Modification, is inconsistent with this Agreement, this Agreement shall govern.

§ 1.2 Relationship of the Parties
The Construction Manager accepts the relationship of trust and confidence established by this Agreement and covenants with the Owner to cooperate with the Architect and exercise the Construction Manager’s skill and judgment in furthering the interests of the Owner; to furnish efficient construction administration, management services and supervision; to furnish at all times an adequate supply of workers and materials; and to perform the Work in an expeditious and economical manner consistent with the Owner’s interests. The Owner agrees to furnish or approve, in a timely manner, information required by the Construction Manager and to make payments to the Construction Manager in accordance with the requirements of the Contract Documents.

§ 1.3 General Conditions
For the Preconstruction Phase, AIA Document A201™–2007, General Conditions of the Contract for Construction, shall apply only as specifically provided in this Agreement. For the Construction Phase, the general conditions of the contract shall be as set forth in A201–2007, which document is incorporated herein by reference. The term “Contractor” as used in A201–2007 shall mean the Construction Manager.

ARTICLE 2 CONSTRUCTION MANAGER’S RESPONSIBILITIES
The Construction Manager’s Preconstruction Phase responsibilities are set forth in Sections 2.1 and 2.2. The Construction Manager’s Construction Phase responsibilities are set forth in Section 2.3. The Owner and
Construction Manager may agree, in consultation with the Architect, for the Construction Phase to commence prior to completion of the Preconstruction Phase, in which case, both phases will proceed concurrently. The Construction Manager shall identify a representative authorized to act on behalf of the Construction Manager with respect to the Project.

§ 2.1 Preconstruction Phase

§ 2.1.1 The Construction Manager shall provide a preliminary evaluation of the Owner’s program, schedule and construction budget requirements, each in terms of the other.

§ 2.1.2 Consultation

The Construction Manager shall schedule and conduct meetings with the Architect and Owner to discuss such matters as procedures, progress, coordination, and scheduling of the Work. The Construction Manager shall advise the Owner and the Architect on proposed site use and improvements, selection of materials, and building systems and equipment. The Construction Manager shall also provide recommendations consistent with the Project requirements to the Owner and Architect on constructability; availability of materials and labor; time requirements for procurement, installation and construction; and factors related to construction cost including, but not limited to, costs of alternative designs or materials, preliminary budgets, life-cycle data, and possible cost reductions.

§ 2.1.3 When Project requirements in Section 3.1.1 have been sufficiently identified, the Construction Manager shall prepare and periodically update a Project schedule for the Architect’s review and the Owner’s acceptance. The Construction Manager shall obtain the Architect’s approval for the portion of the Project schedule relating to the performance of the Architect’s services. The Project schedule shall coordinate and integrate the Construction Manager’s services, the Architect’s services, other Owner consultants’ services, and the Owner’s responsibilities and identify items that could affect the Project’s timely completion. The updated Project schedule shall include the following: submission of the Guaranteed Maximum Price proposal; components of the Work; times of commencement and completion required of each Subcontractor; ordering and delivery of products, including those that must be ordered well in advance of construction; and the occupancy requirements of the Owner.

§ 2.1.4 Phased Construction

The Construction Manager shall provide recommendations with regard to accelerated or fast-track scheduling, procurement, or phased construction. The Construction Manager shall take into consideration cost reductions, cost information, constructability, provisions for temporary facilities and procurement and construction scheduling issues.

§ 2.1.5 Preliminary Cost Estimates

§ 2.1.5.1 Based on the preliminary design and other design criteria prepared by the Architect, the Construction Manager shall prepare preliminary estimates of the Cost of the Work or the cost of program requirements using area, volume or similar conceptual estimating techniques for the Architect’s review and Owner’s approval. If the Architect or Construction Manager suggests alternative materials and systems, the Construction Manager shall provide cost evaluations of those alternative materials and systems.

§ 2.1.5.2 As the Architect progresses with the preparation of the Schematic Design, Design Development and Construction Documents, the Construction Manager shall prepare and update, at appropriate intervals agreed to by the Owner, Construction Manager and Architect, estimates of the Cost of the Work of increasing detail and refinement and allowing for the further development of the design until such time as the Owner and Construction Manager agree on a Guaranteed Maximum Price for the Work. Such estimates shall be provided for the Architect’s review and the Owner’s approval. The Construction Manager shall inform the Owner and Architect when estimates of the Cost of the Work exceed the latest approved Project budget and make recommendations for corrective action.

§ 2.1.6 Subcontractors and Suppliers

The Construction Manager shall develop bidders’ interest in the Project.

§ 2.1.7 The Construction Manager shall prepare, for the Architect’s review and the Owner’s acceptance, a procurement schedule for items that must be ordered well in advance of construction. The Construction Manager shall expedite and coordinate the ordering and delivery of materials that must be ordered well in advance of construction. If the Owner agrees to procure any items prior to the establishment of the Guaranteed Maximum Price, the Owner shall procure the items on terms and conditions acceptable to the Construction Manager. Upon the
establishment of the Guaranteed Maximum Price, the Owner shall assign all contracts for these items to the
Construction Manager and the Construction Manager shall thereafter accept responsibility for them.

§ 2.1.8 Extent of Responsibility
The Construction Manager shall exercise reasonable care in preparing schedules and estimates. The Construction
Manager, however, does not warrant or guarantee estimates and schedules except as may be included as part of the
Guaranteed Maximum Price. The Construction Manager is not required to ascertain that the Drawings and
Specifications are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful
orders of public authorities, but the Construction Manager shall promptly report to the Architect and Owner any
nonconformity discovered by or made known to the Construction Manager as a request for information in such form
as the Architect may require.

§ 2.1.9 Notices and Compliance with Laws
The Construction Manager shall comply with applicable laws, statutes, ordinances, codes, rules and regulations, and
lawful orders of public authorities applicable to its performance under this Contract, and with equal employment
opportunity programs, and other programs as may be required by governmental and quasi governmental authorities
for inclusion in the Contract Documents.

§ 2.2 Guaranteed Maximum Price Proposal and Contract Time
§ 2.2.1 At a time to be mutually agreed upon by the Owner and the Construction Manager and in consultation with
the Architect, the Construction Manager shall prepare a Guaranteed Maximum Price proposal for the Owner’s
review and acceptance. The Guaranteed Maximum Price in the proposal shall be the sum of the Construction
Manager’s estimate of the Cost of the Work, including contingencies described in Section 2.2.4, and the
Construction Manager’s Fee.

§ 2.2.2 To the extent that the Drawings and Specifications are anticipated to require further development by the
Architect, the Construction Manager shall provide in the Guaranteed Maximum Price for such further development
consistent with the Contract Documents and reasonably inferable therefrom. Such further development does not
include such things as changes in scope, systems, kinds and quality of materials, finishes or equipment, all of which,
if required, shall be incorporated by Change Order.

§ 2.2.3 The Construction Manager shall include with the Guaranteed Maximum Price proposal a written statement of
its basis, which shall include the following:
  .1 A list of the Drawings and Specifications, including all Addenda thereto, and the Conditions of the
  Contract;
  .2 A list of the clarifications and assumptions made by the Construction Manager in the preparation of
  the Guaranteed Maximum Price proposal, including assumptions under Section 2.2.2, to supplement
  the information provided by the Owner and contained in the Drawings and Specifications;
  .3 A statement of the proposed Guaranteed Maximum Price, including a statement of the estimated Cost
  of the Work organized by trade categories or systems, allowances, contingency, and the Construction
  Manager’s Fee;
  .4 The anticipated date of Substantial Completion upon which the proposed Guaranteed Maximum Price
  is based; and
  .5 A date by which the Owner must accept the Guaranteed Maximum Price.

§ 2.2.4 In preparing the Construction Manager’s Guaranteed Maximum Price proposal, the Construction Manager
shall include its contingency for the Construction Manager’s exclusive use to cover those costs considered
reimbursable as the Cost of the Work but not included in a Change Order.

§ 2.2.5 The Construction Manager shall meet with the Owner and Architect to review the Guaranteed Maximum
Price proposal. In the event that the Owner and Architect discover any inconsistencies or inaccuracies in the
information presented, they shall promptly notify the Construction Manager, who shall make appropriate
adjustments to the Guaranteed Maximum Price proposal, its basis, or both.

§ 2.2.6 If the Owner notifies the Construction Manager that the Owner has accepted the Guaranteed Maximum Price
proposal in writing before the date specified in the Guaranteed Maximum Price proposal, the Guaranteed Maximum
Price proposal shall be deemed effective without further acceptance from the Construction Manager. Following
acceptance of a Guaranteed Maximum Price, the Owner and Construction Manager shall execute the Guaranteed Maximum Price Amendment amending this Agreement, a copy of which the Owner shall provide to the Architect. The Guaranteed Maximum Price Amendment shall set forth the agreed upon Guaranteed Maximum Price with the information and assumptions upon which it is based.

§ 2.2.7 The Construction Manager shall not incur any cost to be reimbursed as part of the Cost of the Work prior to the commencement of the Construction Phase, unless the Owner provides prior written authorization for such costs.

§ 2.2.8 The Owner shall authorize the Architect to provide the revisions to the Drawings and Specifications to incorporate the agreed-upon assumptions and clarifications contained in the Guaranteed Maximum Price Amendment. The Owner shall promptly furnish those revised Drawings and Specifications to the Construction Manager as they are revised. The Construction Manager shall notify the Owner and Architect of any inconsistencies between the Guaranteed Maximum Price Amendment and the revised Drawings and Specifications.

§ 2.2.9 The Construction Manager shall include in the Guaranteed Maximum Price all sales, consumer, use and similar taxes for the Work provided by the Construction Manager that are legally enacted, whether or not yet effective, at the time the Guaranteed Maximum Price Amendment is executed.

§ 2.3 Construction Phase
§ 2.3.1 General
§ 2.3.1.1 For purposes of Section 8.1.2 of A201–2007, the date of commencement of the Work shall mean the date of commencement of the Construction Phase.

§ 2.3.2 Administration
§ 2.3.2.1 Those portions of the Work that the Construction Manager does not customarily perform with the Construction Manager’s own personnel shall be performed under subcontracts or by other appropriate agreements with the Construction Manager. The Owner may designate specific persons from whom, or entities from which, the Construction Manager shall obtain bids. The Construction Manager shall obtain bids from Subcontractors and from suppliers of materials or equipment fabricated especially for the Work and shall deliver such bids to the Architect. The Owner shall then determine, with the advice of the Construction Manager and the Architect, which bids will be accepted. The Construction Manager shall not be required to contract with anyone to whom the Construction Manager has reasonable objection.

§ 2.3.2.2 If the Guaranteed Maximum Price has been established and when a specific bidder (1) is recommended to the Owner by the Construction Manager, (2) is qualified to perform that portion of the Work, and (3) has submitted a bid that conforms to the requirements of the Contract Documents without reservations or exceptions, but the Owner requires that another bid be accepted, then the Construction Manager may require that a Change Order be issued to adjust the Contract Time and the Guaranteed Maximum Price by the difference between the bid of the person or entity recommended to the Owner by the Construction Manager and the amount and time requirement of the subcontract or other agreement actually signed with the person or entity designated by the Owner.

§ 2.3.2.3 Subcontracts or other agreements shall conform to the applicable payment provisions of this Agreement, and shall not be awarded on the basis of cost plus a fee without the prior consent of the Owner. If the Subcontract is awarded on a cost-plus a fee basis, the Construction Manager shall provide in the Subcontract for the Owner to receive the same audit rights with regard to the Subcontractor as the Owner receives with regard to the Construction Manager in Section 6.11 below.

§ 2.3.2.4 If the Construction Manager recommends a specific bidder that may be considered a “related party” according to Section 6.10, then the Construction Manager shall promptly notify the Owner in writing of such relationship and notify the Owner of the specific nature of the contemplated transaction, according to Section 6.10.2.

§ 2.3.2.5 The Construction Manager shall schedule and conduct meetings to discuss such matters as procedures, progress, coordination, scheduling, and status of the Work. The Construction Manager shall prepare and promptly distribute minutes to the Owner and Architect.
§ 2.3.2.6 Upon the execution of the Guaranteed Maximum Price Amendment, the Construction Manager shall prepare and submit to the Owner and Architect a construction schedule for the Work and submittal schedule in accordance with Section 3.10 of A201–2007.

§ 2.3.2.7 The Construction Manager shall record the progress of the Project. On a monthly basis, or otherwise as agreed to by the Owner, the Construction Manager shall submit written progress reports to the Owner and Architect, showing percentages of completion and other information required by the Owner. The Construction Manager shall also keep, and make available to the Owner and Architect, a daily log containing a record for each day of weather, portions of the Work in progress, number of workers on site, identification of equipment on site, problems that might affect progress of the work, accidents, injuries, and other information required by the Owner.

§ 2.3.2.8 The Construction Manager shall develop a system of cost control for the Work, including regular monitoring of actual costs for activities in progress and estimates for uncompleted tasks and proposed changes. The Construction Manager shall identify variances between actual and estimated costs and report the variances to the Owner and Architect and shall provide this information in its monthly reports to the Owner and Architect, in accordance with Section 2.3.2.7 above.

§ 2.4 Professional Services
Section 3.12.10 of A201–2007 shall apply to both the Preconstruction and Construction Phases.

§ 2.5 Hazardous Materials
Section 10.3 of A201–2007 shall apply to both the Preconstruction and Construction Phases.

ARTICLE 3 OWNER’S RESPONSIBILITIES

§ 3.1 Information and Services Required of the Owner
§ 3.1.1 The Owner shall provide information with reasonable promptness, regarding requirements for and limitations on the Project, including a written program which shall set forth the Owner’s objectives, constraints, and criteria, including schedule, space requirements and relationships, flexibility and expandability, special equipment, systems sustainability and site requirements.

§ 3.1.2 Prior to the execution of the Guaranteed Maximum Price Amendment, the Construction Manager may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner’s obligations under the Contract. Thereafter, the Construction Manager may only request such evidence if (1) the Owner fails to make payments to the Construction Manager as the Contract Documents require, (2) a change in the Work materially changes the Contract Sum, or (3) the Construction Manager identifies in writing a reasonable concern regarding the Owner’s ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Construction Manager and Architect.

§ 3.1.3 The Owner shall establish and periodically update the Owner’s budget for the Project, including (1) the budget for the Cost of the Work as defined in Section 6.1.1, (2) the Owner’s other costs, and (3) reasonable contingencies related to all of these costs. If the Owner significantly increases or decreases the Owner’s budget for the Cost of the Work, the Owner shall notify the Construction Manager and Architect. The Owner and the Architect, in consultation with the Construction Manager, shall thereafter agree to a corresponding change in the Project’s scope and quality.

§ 3.1.4 Structural and Environmental Tests, Surveys and Reports. During the Preconstruction Phase, the Owner shall furnish the following information or services with reasonable promptness. The Owner shall also furnish any other information or services under the Owner’s control and relevant to the Construction Manager’s performance of the Work with reasonable promptness after receiving the Construction Manager’s written request for such information or services. The Construction Manager shall be entitled to rely on the accuracy of information and services furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.
§ 3.1.4.1 The Owner shall furnish tests, inspections and reports required by law and as otherwise agreed to by the parties, such as structural, mechanical, and chemical tests, tests for air and water pollution, and tests for hazardous materials.

§ 3.1.4.2 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 surveys and legal information shall include, as applicable, grades and lines of streets, alleys, pavements and adjoining property and structures; designated wetlands; adjacent drainage; rights-of-way, restrictions, easements, encroachments, zoning, deed restrictions, boundaries and contours of the site; locations, dimensions and necessary data with respect to existing buildings, other improvements and trees; and information concerning available utility services and lines, both public and private, above and below grade, including inverts and depths. All the information on the survey shall be referenced to a Project benchmark.

§ 3.1.4.3 The Owner, when such services are requested, shall furnish services of geotechnical engineers, which may include but are not limited to test borings, test pits, determinations of soil bearing values, percolation tests, evaluations of hazardous materials, seismic evaluation, ground corrosion tests and resistivity tests, including necessary operations for anticipating subsoil conditions, with written reports and appropriate recommendations.

§ 3.1.4.4 During the Construction Phase, 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 Construction Manager’s performance of the Work with reasonable promptness after receiving the Construction Manager’s written request for such information or services.

§ 3.2 Owner's Designated Representative
The Owner shall identify a representative authorized to act on behalf of the Owner with respect to the Project. The Owner’s representative shall render decisions promptly and furnish information expeditiously, so as to avoid unreasonable delay in the services or Work of the Construction Manager. Except as otherwise provided in Section 4.2.1 of A201–2007, the Architect does not have such authority. The term “Owner” means the Owner or the Owner’s authorized representative.

§ 3.2.1 Legal Requirements. The Owner shall furnish all legal, insurance and accounting services, including auditing services, that may be reasonably necessary at any time for the Project to meet the Owner’s needs and interests.

§ 3.3 Architect
The Owner shall retain an Architect to provide services, duties and responsibilities as described in AIA Document B103™–2007, Standard Form of Agreement Between Owner and Architect, including any additional services requested by the Construction Manager that are necessary for the Preconstruction and Construction Phase services under this Agreement. The Owner shall provide the Construction Manager a copy of the executed agreement between the Owner and the Architect, and any further modifications to the agreement.

ARTICLE 4 COMPENSATION AND PAYMENTS FOR PRECONSTRUCTION PHASE SERVICES
§ 4.1 Compensation
§ 4.1.1 For the Construction Manager’s Preconstruction Phase services, the Owner shall compensate the Construction Manager as follows:

§ 4.1.2 For the Construction Manager’s Preconstruction Phase services described in Sections 2.1 and 2.2:
(Insert amount of, or basis for, compensation and include a list of reimbursable cost items, as applicable.)

§ 4.1.3 If the Preconstruction Phase services covered by this Agreement have not been completed within «  » ( «  » ) months of the date of this Agreement, through no fault of the Construction Manager, the Construction Manager’s compensation for Preconstruction Phase services shall be equitably adjusted.

§ 4.1.4 Compensation based on Direct Personnel Expense includes the direct salaries of the Construction Manager’s personnel providing Preconstruction Phase services on the Project and the Construction Manager’s costs for the mandatory and customary contributions and benefits related thereto, such as employment taxes and other statutory employee benefits, insurance, sick leave, holidays, vacations, employee retirement plans and similar contributions.
§ 4.2 Payments
§ 4.2.1 Unless otherwise agreed, payments for services shall be made monthly in proportion to services performed.

§ 4.2.2 Payments are due and payable upon presentation of the Construction Manager’s invoice. Amounts unpaid « » ( « » ) days after the invoice date shall bear interest at the rate entered below, or in the absence thereof at the legal rate prevailing from time to time at the principal place of business of the Construction Manager.

(Insert rate of monthly or annual interest agreed upon.)

« » % « »

ARTICLE 5 COMPENSATION FOR CONSTRUCTION PHASE SERVICES
§ 5.1 For the Construction Manager’s performance of the Work as described in Section 2.3, the Owner shall pay the Construction Manager the Contract Sum in current funds. The Contract Sum is the Cost of the Work as defined in Section 6.1.1 plus the Construction Manager’s Fee.

§ 5.1.1 The Construction Manager’s Fee:
(State a lump sum, percentage of Cost of the Work or other provision for determining the Construction Manager’s Fee.)

« »

§ 5.1.2 The method of adjustment of the Construction Manager’s Fee for changes in the Work:

« »

§ 5.1.3 Limitations, if any, on a Subcontractor’s overhead and profit for increases in the cost of its portion of the Work:

« »

§ 5.1.4 Rental rates for Construction Manager-owned equipment shall not exceed « » percent ( « » %) of the standard rate paid at the place of the Project.

§ 5.1.5 Unit prices, if any:
(Identify and state the unit price; state the quantity limitations, if any, to which the unit price will be applicable.)

<table>
<thead>
<tr>
<th>Item</th>
<th>Units and Limitations</th>
<th>Price per Unit ($0.00)</th>
</tr>
</thead>
</table>

§ 5.2 Guaranteed Maximum Price
§ 5.2.1 The Construction Manager guarantees that the Contract Sum shall not exceed the Guaranteed Maximum Price set forth in the Guaranteed Maximum Price Amendment, as it is amended from time to time. To the extent the Cost of the Work exceeds the Guaranteed Maximum Price, the Construction Manager shall bear such costs in excess of the Guaranteed Maximum Price without reimbursement or additional compensation from the Owner.

(Insert specific provisions if the Construction Manager is to participate in any savings.)

« »

§ 5.2.2 The Guaranteed Maximum Price is subject to additions and deductions by Change Order as provided in the Contract Documents and the Date of Substantial Completion shall be subject to adjustment as provided in the Contract Documents.

§ 5.3 Changes in the Work
§ 5.3.1 The Owner may, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions. The Owner shall issue such changes in writing. The Architect may make minor changes in the Work as provided in Section 7.4 of AIA Document A201–2007, General

User Notes: [1764445026]
Conditions of the Contract for Construction. The Construction Manager shall be entitled to an equitable adjustment in the Contract Time as a result of changes in the Work.

§ 5.3.2 Adjustments to the Guaranteed Maximum Price on account of changes in the Work subsequent to the execution of the Guaranteed Maximum Price Amendment may be determined by any of the methods listed in Section 7.3.3 of AIA Document A201–2007, General Conditions of the Contract for Construction.

§ 5.3.3 In calculating adjustments to subcontracts (except those awarded with the Owner’s prior consent on the basis of cost plus a fee), the terms “cost” and “fee” as used in Section 7.3.3 of AIA Document A201–2007 and the term “costs” as used in Section 7.7 of AIA Document A201–2007 shall have the meanings assigned to them in AIA Document A201–2007 and shall not be modified by Sections 5.1 and 5.2, Sections 6.1 through 6.7, and Section 6.8 of this Agreement. Adjustments to subcontracts awarded with the Owner’s prior consent on the basis of cost plus a fee shall be calculated in accordance with the terms of those subcontracts.

§ 5.3.4 In calculating adjustments to the Guaranteed Maximum Price, the terms “cost” and “costs” as used in the above-referenced provisions of AIA Document A201–2007 shall mean the Cost of the Work as defined in Sections 6.1 to 6.7 of this Agreement and the term “fee” shall mean the Construction Manager’s Fee as defined in Section 5.1 of this Agreement.

§ 5.3.5 If no specific provision is made in Section 5.1.2 for adjustment of the Construction Manager’s Fee in the case of changes in the Work, or if the extent of such changes is such, in the aggregate, that application of the adjustment provisions of Section 5.1.2 will cause substantial inequity to the Owner or Construction Manager, the Construction Manager’s Fee shall be equitably adjusted on the same basis that was used to establish the Fee for the original Work, and the Guaranteed Maximum Price shall be adjusted accordingly.

ARTICLE 6 COST OF THE WORK FOR CONSTRUCTION PHASE
§ 6.1 Costs to Be Reimbursed
§ 6.1.1 The term Cost of the Work shall mean costs necessarily incurred by the Construction Manager in the proper performance of the Work. Such costs shall be at rates not higher than the standard paid at the place of the Project except with prior consent of the Owner. The Cost of the Work shall include only the items set forth in Sections 6.1 through 6.7.

§ 6.1.2 Where any cost is subject to the Owner’s prior approval, the Construction Manager shall obtain this approval prior to incurring the cost. The parties shall endeavor to identify any such costs prior to executing Guaranteed Maximum Price Amendment.

§ 6.2 Labor Costs
§ 6.2.1 Wages of construction workers directly employed by the Construction Manager to perform the construction of the Work at the site or, with the Owner’s prior approval, at off-site workshops.

§ 6.2.2 Wages or salaries of the Construction Manager’s supervisory and administrative personnel when stationed at the site with the Owner’s prior approval.

(If it is intended that the wages or salaries of certain personnel stationed at the Construction Manager’s principal or other offices shall be included in the Cost of the Work, identify in Section 11.5, the personnel to be included, whether for all or only part of their time, and the rates at which their time will be charged to the Work.)

§ 6.2.3 Wages and salaries of the Construction Manager’s supervisory or administrative personnel engaged at factories, workshops or on the road, in expediting the production or transportation of materials or equipment required for the Work, but only for that portion of their time required for the Work.

§ 6.2.4 Costs paid or incurred by the Construction Manager for taxes, insurance, contributions, assessments and benefits required by law or collective bargaining agreements and, for personnel not covered by such agreements, customary benefits such as sick leave, medical and health benefits, holidays, vacations and pensions, provided such costs are based on wages and salaries included in the Cost of the Work under Sections 6.2.1 through 6.2.3.

§ 6.2.5 Bonuses, profit sharing, incentive compensation and any other discretionary payments paid to anyone hired by the Construction Manager or paid to any Subcontractor or vendor, with the Owner’s prior approval.
§ 6.3 Subcontract Costs
Payments made by the Construction Manager to Subcontractors in accordance with the requirements of the subcontracts.

§ 6.4 Costs of Materials and Equipment Incorporated in the Completed Construction
§ 6.4.1 Costs, including transportation and storage, of materials and equipment incorporated or to be incorporated in the completed construction.

§ 6.4.2 Costs of materials described in the preceding Section 6.4.1 in excess of those actually installed to allow for reasonable waste and spoilage. Unused excess materials, if any, shall become the Owner’s property at the completion of the Work or, at the Owner’s option, shall be sold by the Construction Manager. Any amounts realized from such sales shall be credited to the Owner as a deduction from the Cost of the Work.

§ 6.5 Costs of Other Materials and Equipment, Temporary Facilities and Related Items
§ 6.5.1 Costs of transportation, storage, installation, maintenance, dismantling and removal of materials, supplies, temporary facilities, machinery, equipment and hand tools not customarily owned by construction workers that are provided by the Construction Manager at the site and fully consumed in the performance of the Work. Costs of materials, supplies, temporary facilities, machinery, equipment and tools that are not fully consumed shall be based on the cost or value of the item at the time it is first used on the Project site less the value of the item when it is no longer used at the Project site. Costs for items not fully consumed by the Construction Manager shall mean fair market value.

§ 6.5.2 Rental charges for temporary facilities, machinery, equipment and hand tools not customarily owned by construction workers that are provided by the Construction Manager at the site and costs of transportation, installation, minor repairs, dismantling and removal. The total rental cost of any Construction Manager-owned item may not exceed the purchase price of any comparable item. Rates of Construction Manager-owned equipment and quantities of equipment shall be subject to the Owner’s prior approval.

§ 6.5.3 Costs of removal of debris from the site of the Work and its proper and legal disposal.

§ 6.5.4 Costs of document reproductions, facsimile transmissions and long-distance telephone calls, postage and parcel delivery charges, telephone service at the site and reasonable petty cash expenses of the site office.

§ 6.5.5 That portion of the reasonable expenses of the Construction Manager’s supervisory or administrative personnel incurred while traveling in discharge of duties connected with the Work.

§ 6.5.6 Costs of materials and equipment suitably stored off the site at a mutually acceptable location, subject to the Owner’s prior approval.

§ 6.6 Miscellaneous Costs
§ 6.6.1 Premiums for that portion of insurance and bonds required by the Contract Documents that can be directly attributed to this Contract. Self-insurance for either full or partial amounts of the coverages required by the Contract Documents, with the Owner’s prior approval.

§ 6.6.2 Sales, use or similar taxes imposed by a governmental authority that are related to the Work and for which the Construction Manager is liable.

§ 6.6.3 Fees and assessments for the building permit and for other permits, licenses and inspections for which the Construction Manager is required by the Contract Documents to pay.

§ 6.6.4 Fees of laboratories for tests required by the Contract Documents, except those related to defective or nonconforming Work for which reimbursement is excluded by Section 13.5.3 of AIA Document A201–2007 or by other provisions of the Contract Documents, and which do not fall within the scope of Section 6.7.3.

§ 6.6.5 Royalties and license fees paid for the use of a particular design, process or product required by the Contract Documents; the cost of defending suits or claims for infringement of patent rights arising from such requirement of
the Contract Documents; and payments made in accordance with legal judgments against the Construction Manager resulting from such suits or claims and payments of settlements made with the Owner’s consent. However, such costs of legal defenses, judgments and settlements shall not be included in the calculation of the Construction Manager’s Fee or subject to the Guaranteed Maximum Price. If such royalties, fees and costs are excluded by the last sentence of Section 3.17 of AIA Document A201–2007 or other provisions of the Contract Documents, then they shall not be included in the Cost of the Work.

§ 6.6.6 Costs for electronic equipment and software, directly related to the Work with the Owner’s prior approval.

§ 6.6.7 Deposits lost for causes other than the Construction Manager’s negligence or failure to fulfill a specific responsibility in the Contract Documents.

§ 6.6.8 Legal, mediation and arbitration costs, including attorneys’ fees, other than those arising from disputes between the Owner and Construction Manager, reasonably incurred by the Construction Manager after the execution of this Agreement in the performance of the Work and with the Owner’s prior approval, which shall not be unreasonably withheld.

§ 6.6.9 Subject to the Owner’s prior approval, expenses incurred in accordance with the Construction Manager’s standard written personnel policy for relocation and temporary living allowances of the Construction Manager’s personnel required for the Work.

§ 6.7 Other Costs and Emergencies

§ 6.7.1 Other costs incurred in the performance of the Work if, and to the extent, approved in advance in writing by the Owner.

§ 6.7.2 Costs incurred in taking action to prevent threatened damage, injury or loss in case of an emergency affecting the safety of persons and property, as provided in Section 10.4 of AIA Document A201–2007.

§ 6.7.3 Costs of repairing or correcting damaged or nonconforming Work executed by the Construction Manager, Subcontractors or suppliers, provided that such damaged or nonconforming Work was not caused by negligence or failure to fulfill a specific responsibility of the Construction Manager and only to the extent that the cost of repair or correction is not recovered by the Construction Manager from insurance, sureties, Subcontractors, suppliers, or others.

§ 6.7.4 The costs described in Sections 6.1 through 6.7 shall be included in the Cost of the Work, notwithstanding any provision of AIA Document A201–2007 or other Conditions of the Contract which may require the Construction Manager to pay such costs, unless such costs are excluded by the provisions of Section 6.8.

§ 6.8 Costs Not To Be Reimbursed

§ 6.8.1 The Cost of the Work shall not include the items listed below:

.1 Salaries and other compensation of the Construction Manager’s personnel stationed at the Construction Manager’s principal office or offices other than the site office, except as specifically provided in Section 6.2, or as may be provided in Article 11;

.2 Expenses of the Construction Manager’s principal office and offices other than the site office;

.3 Overhead and general expenses, except as may be expressly included in Sections 6.1 to 6.7;

.4 The Construction Manager’s capital expenses, including interest on the Construction Manager’s capital employed for the Work;

.5 Except as provided in Section 6.7.3 of this Agreement, costs due to the negligence or failure of the Construction Manager, Subcontractors and suppliers or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable to fulfill a specific responsibility of the Contract;

.6 Any cost not specifically and expressly described in Sections 6.1 to 6.7;

.7 Costs, other than costs included in Change Orders approved by the Owner, that would cause the Guaranteed Maximum Price to be exceeded; and

.8 Costs for services incurred during the Preconstruction Phase.
§ 6.9 Discounts, Rebates and Refunds

§ 6.9.1 Cash discounts obtained on payments made by the Construction Manager shall accrue to the Owner if (1) before making the payment, the Construction Manager included them in an Application for Payment and received payment from the Owner, or (2) the Owner has deposited funds with the Construction Manager with which to make payments; otherwise, cash discounts shall accrue to the Construction Manager. Trade discounts, rebates, refunds and amounts received from sales of surplus materials and equipment shall accrue to the Owner, and the Construction Manager shall make provisions so that they can be obtained.

§ 6.9.2 Amounts that accrue to the Owner in accordance with the provisions of Section 6.9.1 shall be credited to the Owner as a deduction from the Cost of the Work.

§ 6.10 Related Party Transactions

§ 6.10.1 For purposes of Section 6.10, the term “related party” shall mean a parent, subsidiary, affiliate or other entity having common ownership or management with the Construction Manager; any entity in which any stockholder in, or management employee of, the Construction Manager owns any interest in excess of ten percent in the aggregate; or any person or entity which has the right to control the business or affairs of the Construction Manager. The term “related party” includes any member of the immediate family of any person identified above.

§ 6.10.2 If any of the costs to be reimbursed arise from a transaction between the Construction Manager and a related party, the Construction Manager shall notify the Owner of the specific nature of the contemplated transaction, including the identity of the related party and the anticipated cost to be incurred, before any such transaction is consummated or cost incurred. If the Owner, after such notification, authorizes the proposed transaction, then the cost incurred shall be included as a cost to be reimbursed, and the Construction Manager shall procure the Work, equipment, goods or service from the related party, as a Subcontractor, according to the terms of Sections 2.3.2.1, 2.3.2.2 and 2.3.2.3. If the Owner fails to authorize the transaction, the Construction Manager shall procure the Work, equipment, goods or service from some person or entity other than a related party according to the terms of Sections 2.3.2.1, 2.3.2.2 and 2.3.2.3.

§ 6.11 Accounting Records

The Construction Manager shall keep full and detailed records and accounts related to the cost of the Work and exercise such controls as may be necessary for proper financial management under this Contract and to substantiate all costs incurred. The accounting and control systems shall be satisfactory to the Owner. The Owner and the Owner’s auditors shall, during regular business hours and upon reasonable notice, be afforded access to, and shall be permitted to audit and copy, the Construction Manager’s records and accounts, including complete documentation supporting accounting entries, books, correspondence, instructions, drawings, receipts, subcontracts, Subcontractor’s proposals, purchase orders, vouchers, memoranda and other data relating to this Contract. The Construction Manager shall preserve these records for a period of three years after final payment, or for such longer period as may be required by law.

ARTICLE 7 PAYMENTS FOR CONSTRUCTION PHASE SERVICES

§ 7.1 Progress Payments

§ 7.1.1 Based upon Applications for Payment submitted to the Architect by the Construction Manager and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Construction Manager as provided below and elsewhere in the Contract Documents.

§ 7.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« »

§ 7.1.3 Provided that an Application for Payment is received by the Architect not later than the « » day of a month, the Owner shall make payment of the certified amount to the Construction Manager not later than the « » day of the « » month. If an Application for Payment is received by the Architect after the application date fixed above, payment shall be made by the Owner not later than « » « » days after the Architect receives the Application for Payment.

(Federal, state or local laws may require payment within a certain period of time.)
§ 7.1.4 With each Application for Payment, the Construction Manager shall submit payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached, and any other evidence required by the Owner or Architect to demonstrate that cash disbursements already made by the Construction Manager on account of the Cost of the Work equal or exceed progress payments already received by the Construction Manager, less that portion of those payments attributable to the Construction Manager’s Fee, plus payrolls for the period covered by the present Application for Payment.

§ 7.1.5 Each Application for Payment shall be based on the most recent schedule of values submitted by the Construction Manager in accordance with the Contract Documents. The schedule of values shall allocate the entire Guaranteed Maximum Price among the various portions of the Work, except that the Construction Manager’s Fee shall be shown as a single separate item. The schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Construction Manager’s Applications for Payment.

§ 7.1.6 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment. The percentage of completion shall be the lesser of (1) the percentage of that portion of the Work which has actually been completed, or (2) the percentage obtained by dividing (a) the expense that has actually been incurred by the Construction Manager on account of that portion of the Work for which the Construction Manager has made or intends to make actual payment prior to the next percentage of that portion of the Work which has actually been completed, or (2) the percentage obtained by dividing (a) the expense that has actually been incurred by the Construction Manager on account of that portion of the Work for which the Construction Manager has made or intends to make actual payment prior to the next Application for Payment by (b) the share of the Guaranteed Maximum Price allocated to that portion of the Work in the schedule of values.

§ 7.1.7 Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

1. Take that portion of the Guaranteed Maximum Price properly allocable to completed Work as determined by multiplying the percentage of completion of each portion of the Work by the share of the Guaranteed Maximum Price allocated to that portion of the Work in the schedule of values. Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 7.3.9 of AIA Document A201–2007;

2. Add that portion of the Guaranteed Maximum Price properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work, or if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing;

3. Add the Construction Manager’s Fee, less retainage of « » percent (« » %). The Construction Manager’s Fee shall be computed upon the Cost of the Work at the rate stated in Section 5.1 or, if the Construction Manager’s Fee is stated as a fixed sum in that Section, shall be an amount that bears the same ratio to that fixed-sum fee as the Cost of the Work bears to a reasonable estimate of the probable Cost of the Work upon its completion;

4. Subtract retainage of « » percent (« » %) from that portion of the Work that the Construction Manager self-performs;

5. Subtract the aggregate of previous payments made by the Owner;

6. Subtract the shortfall, if any, indicated by the Construction Manager in the documentation required by Section 7.1.4 to substantiate prior Applications for Payment, or resulting from errors subsequently discovered by the Owner’s auditors in such documentation; and

7. Subtract amounts, if any, for which the Architect has withheld or nullified a Certificate for Payment as provided in Section 9.5 of AIA Document A201–2007.

§ 7.1.8 The Owner and Construction Manager shall agree upon (1) a mutually acceptable procedure for review and approval of payments to Subcontractors and (2) the percentage of retainage held on Subcontracts, and the Construction Manager shall execute subcontracts in accordance with those agreements.

§ 7.1.9 Except with the Owner’s prior approval, the Construction Manager shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 7.1.10 In taking action on the Construction Manager’s Applications for Payment, the Architect shall be entitled to rely on the accuracy and completeness of the information furnished by the Construction Manager and shall not be deemed to represent that the Architect has made a detailed examination, audit or arithmetic verification of the documentation submitted in accordance with Section 7.1.4 or other supporting data; that the Architect has made
exhaustive or continuous on-site inspections; or that the Architect has made examinations to ascertain how or for what purposes the Construction Manager has used amounts previously paid on account of the Contract. Such examinations, audits and verifications, if required by the Owner, will be performed by the Owner’s auditors acting in the sole interest of the Owner.

§ 7.2 Final Payment
§ 7.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Construction Manager when

.1 the Construction Manager has fully performed the Contract except for the Construction Manager’s responsibility to correct Work as provided in Section 12.2.2 of AIA Document A201–2007, and to satisfy other requirements, if any, which extend beyond final payment;

.2 the Construction Manager has submitted a final accounting for the Cost of the Work and a final Application for Payment; and

.3 a final Certificate for Payment has been issued by the Architect.

The Owner’s final payment to the Construction Manager shall be made no later than 30 days after the issuance of the Architect’s final Certificate for Payment, or as follows:

« »

§ 7.2.2 The Owner’s auditors will review and report in writing on the Construction Manager’s final accounting within 30 days after delivery of the final accounting to the Architect by the Construction Manager. Based upon such Cost of the Work as the Owner’s auditors report to be substantiated by the Construction Manager’s final accounting, and provided the other conditions of Section 7.2.1 have been met, the Architect will, within seven days after receipt of the written report of the Owner’s auditors, either issue to the Owner a final Certificate for Payment with a copy to the Construction Manager, or notify the Construction Manager and Owner in writing of the Architect’s reasons for withholding a certificate as provided in Section 9.5.1 of the AIA Document A201–2007. The time periods stated in this Section supersede those stated in Section 9.4.1 of the AIA Document A201–2007. The Architect is not responsible for verifying the accuracy of the Construction Manager’s final accounting.

§ 7.2.3 If the Owner’s auditors report the Cost of the Work as substantiated by the Construction Manager’s final accounting to be less than claimed by the Construction Manager, the Construction Manager shall be entitled to request mediation of the disputed amount without seeking an initial decision pursuant to Section 15.2 of A201–2007. A request for mediation shall be made by the Construction Manager within 30 days after the Construction Manager’s receipt of a copy of the Architect’s final Certificate for Payment. Failure to request mediation within this 30-day period shall result in the substantiated amount reported by the Owner’s auditors becoming binding on the Construction Manager. Pending a final resolution of the disputed amount, the Owner shall pay the Construction Manager the amount certified in the Architect’s final Certificate for Payment.

§ 7.2.4 If, subsequent to final payment and at the Owner’s request, the Construction Manager incurs costs described in Section 6.1.1 and not excluded by Section 6.8 to correct defective or nonconforming Work, the Owner shall reimburse the Construction Manager such costs and the Construction Manager’s Fee applicable thereto on the same basis as if such costs had been incurred prior to final payment, but not in excess of the Guaranteed Maximum Price. If the Construction Manager has participated in savings as provided in Section 5.2.1, the amount of such savings shall be recalculated and appropriate credit given to the Owner in determining the net amount to be paid by the Owner to the Construction Manager.

ARTICLE 8 INSURANCE AND BONDS
For all phases of the Project, the Construction Manager and the Owner shall purchase and maintain insurance, and the Construction Manager shall provide bonds as set forth in Article 11 of AIA Document A201–2007.

(State bonding requirements, if any, and limits of liability for insurance required in Article 11 of AIA Document A201–2007.)

<table>
<thead>
<tr>
<th>Type of Insurance or Bond</th>
<th>Limit of Liability or Bond Amount ($0.00)</th>
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User Notes:
ARTICLE 9  DISPUTE RESOLUTION
§ 9.1 Any Claim between the Owner and Construction Manager shall be resolved in accordance with the provisions set forth in this Article 9 and Article 15 of A201–2007. However, for Claims arising from or relating to the Construction Manager’s Preconstruction Phase services, no decision by the Initial Decision Maker shall be required as a condition precedent to mediation or binding dispute resolution, and Section 9.3 of this Agreement shall not apply.

§ 9.2 For any Claim subject to, but not resolved by mediation pursuant to Section 15.3 of AIA Document A201–2007, the method of binding dispute resolution shall be as follows:
(Inject the appropriate box. If the Owner and Construction Manager do not select a method of binding dispute resolution below, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.)

• [ ] Arbitration pursuant to Section 15.4 of AIA Document A201–2007
• [ ] Litigation in a court of competent jurisdiction
• [ ] Other: (Specify)

§ 9.3 Initial Decision Maker
The Architect will serve as the Initial Decision Maker pursuant to Section 15.2 of AIA Document A201–2007 for Claims arising from or relating to the Construction Manager’s Construction Phase services, unless the parties appoint below another individual, not a party to the Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

ARTICLE 10  TERMINATION OR SUSPENSION
§ 10.1 Termination Prior to Establishment of the Guaranteed Maximum Price
§ 10.1.1 Prior to the execution of the Guaranteed Maximum Price Amendment, the Owner may terminate this Agreement upon not less than seven days’ written notice to the Construction Manager for the Owner’s convenience and without cause, and the Construction Manager may terminate this Agreement, upon not less than seven days’ written notice to the Owner, for the reasons set forth in Section 14.1.1 of A201–2007.

§ 10.1.2 In the event of termination of this Agreement pursuant to Section 10.1.1, the Construction Manager shall be equitably compensated for Preconstruction Phase services performed prior to receipt of a notice of termination. In no event shall the Construction Manager’s compensation under this Section exceed the compensation set forth in Section 4.1.

§ 10.1.3 If the Owner terminates the Contract pursuant to Section 10.1.1 after the commencement of the Construction Phase but prior to the execution of the Guaranteed Maximum Price Amendment, the Owner shall pay to the Construction Manager an amount calculated as follows, which amount shall be in addition to any compensation paid to the Construction Manager under Section 10.1.2:

1. Take the Cost of the Work incurred by the Construction Manager to the date of termination;
2. Add the Construction Manager’s Fee computed upon the Cost of the Work to the date of termination at the rate stated in Section 5.1 or, if the Construction Manager’s Fee is stated as a fixed sum in that Section, an amount that bears the same ratio to that fixed-sum Fee as the Cost of the Work at the time of termination bears to a reasonable estimate of the probable Cost of the Work upon its completion; and
3. Subtract the aggregate of previous payments made by the Owner for Construction Phase services.
The Owner shall also pay the Construction Manager fair compensation, either by purchase or rental at the election of the Owner, for any equipment owned by the Construction Manager which the Owner elects to retain and which is not otherwise included in the Cost of the Work under Section 10.1.3.1. To the extent that the Owner elects to take legal assignment of subcontracts and purchase orders (including rental agreements), the Construction Manager shall, as a condition of receiving the payments referred to in this Article 10, execute and deliver all such papers and take all such steps, including the legal assignment of such subcontracts and other contractual rights of the Construction Manager, as the Owner may require for the purpose of fully vesting in the Owner the rights and benefits of the Construction Manager under such subcontracts or purchase orders. All Subcontracts, purchase orders and rental agreements entered into by the Construction Manager will contain provisions allowing for assignment to the Owner as described above.

If the Owner accepts assignment of subcontracts, purchase orders or rental agreements as described above, the Owner will reimburse or indemnify the Construction Manager for all costs arising under the subcontract, purchase order or rental agreement, if those costs would have been reimbursable as Cost of the Work if the contract had not been terminated. If the Owner chooses not to accept assignment of any subcontract, purchase order or rental agreement that would have constituted a Cost of the Work had this agreement not been terminated, the Construction Manager will terminate the subcontract, purchase order or rental agreement and the Owner will pay the Construction Manager the costs necessarily incurred by the Construction Manager because of such termination.

§ 10.2 Termination Subsequent to Establishing Guaranteed Maximum Price
Following execution of the Guaranteed Maximum Price Amendment and subject to the provisions of Section 10.2.1 and 10.2.2 below, the Contract may be terminated as provided in Article 14 of AIA Document A201–2007.

§ 10.2.1 If the Owner terminates the Contract after execution of the Guaranteed Price Amendment, the amount payable to the Construction Manager pursuant to Sections 14.2 and 14.4 of A201–2007 shall not exceed the amount the Construction Manager would otherwise have received pursuant to Sections 10.1.2 and 10.1.3 of this Agreement.

§ 10.2.2 If the Construction Manager terminates the Contract after execution of the Guaranteed Maximum Price Amendment, the amount payable to the Construction Manager under Section 14.1.3 of A201–2007 shall not exceed the amount the Construction Manager would otherwise have received under Sections 10.1.2 and 10.1.3 above, except that the Construction Manager’s Fee shall be calculated as if the Work had been fully completed by the Construction Manager, utilizing as necessary a reasonable estimate of the Cost of the Work for Work not actually completed.

§ 10.3 Suspension
The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2007. In such case, the Guaranteed Maximum Price and Contract Time shall be increased as provided in Section 14.3.2 of AIA Document A201–2007, except that the term “profit” shall be understood to mean the Construction Manager’s Fee as described in Sections 5.1 and 5.3.5 of this Agreement.

ARTICLE 11 MISCELLANEOUS PROVISIONS
§ 11.1 Terms in this Agreement shall have the same meaning as those in A201–2007.

§ 11.2 Ownership and Use of Documents
Section 1.5 of A201–2007 shall apply to both the Preconstruction and Construction Phases.

§ 11.3 Governing Law
Section 13.1 of A201–2007 shall apply to both the Preconstruction and Construction Phases.

§ 11.4 Assignment
The Owner and Construction Manager, respectively, bind themselves, their agents, successors, assigns and legal representatives to this Agreement. Neither the Owner nor the Construction Manager shall assign this Agreement without the written consent of the other, except that the Owner may assign this Agreement to a lender providing financing for the Project if the lender agrees to assume the Owner’s rights and obligations under this Agreement. Except as provided in Section 13.2.2 of A201–2007, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.
§ 11.5 Other provisions:

ARTICLE 12 SCOPE OF THE AGREEMENT

§ 12.1 This Agreement represents the entire and integrated agreement between the Owner and the Construction Manager and supersedes all prior negotiations, representations or agreements, either written or oral. This Agreement may be amended only by written instrument signed by both Owner and Construction Manager.

§ 12.2 The following documents comprise the Agreement:

.1 AIA Document A133–2009, Standard Form of Agreement Between Owner and Construction Manager as Constructor where the basis of payment is the Cost of the Work Plus a Fee with a Guaranteed Maximum Price

.2 AIA Document A201–2007, General Conditions of the Contract for Construction

.3 AIA Document E201™–2007, Digital Data Protocol Exhibit, if completed, or the following:

.4 AIA Document E202™–2008, Building Information Modeling Protocol Exhibit, if completed, or the following:

.5 Other documents:

(List other documents, if any, forming part of the Agreement.)

This Agreement is entered into as of the day and year first written above.

OWNER (Signature)

CONSTRUCTION MANAGER (Signature)

(Printed name and title)
SUBCONTRACTOR AGREEMENT

Contractor: LANGLAS & ASSOCIATES, INC. BOZ
1019 EAST MAIN STREET
SUITE 101
BOZEMAN, MT 59715
(406) 585-3420

Subcontractor: ACME CONSTRUCTION, INC.
SAMPLE STREET
BOZEMAN, MT 59815
(XXX) XXX-XXXX

Project: MSU Dining Hall
Bozeman, MT 59771

Purchase Order #: TBD

THIS SUBCONTRACT AGREEMENT is effective as of 2/26/2016, between Contractor and Subcontractor. The
parties agree as follows:

1. Subcontractor shall furnish
   all necessary labor, materials, tools, equipment (including safety equipment) and coordination with other trades required for
   completion of the following Work

   A complete job of all work per Plans and Specifications by Mosaic Architecture dated . Complete contract
documents further defined by attached Exhibit A, Contract Document Index.

   Contract Includes:
   All labor, material and equipment necessary for complete scope of work including, but not limited to, items specifically
called out in Exhibit "B", Bid Package Description.

   Subcontractor agrees to requirments listed in Exhibit "C", General Requirements for all Bid Packages, as attached to this
contract and issued in Addendum 1.

   in the construction of the above-named Project in accordance with the terms and provisions of the contract documents, including
the invitation to bidders, the instructions to bidders, the proposal, the contract, all plans, specifications, the general conditions, the
special conditions, the bond, addenda.

2. Scope of Work
   Whether or not enumerated in the plans or specifications, the Work includes:
   (a) Any item of labor, services and material described in or reasonably inferred from the plans and specifications or customarily
       furnished as a part of performing work of the type required by this Subcontract, or to make the work comply with any law, ordinance
       or regulation, including but not limited to all scaffolding and equipment necessary or required for the performance of the Work, and
       all items and/or quantities that may be required by the actual conditions of the site.
   (b) All plans, drawings, permits and fees required by law, regulations, ordinances or building codes.
   Subcontractor shall provide, at its own expense, all ventilation, storage space, test samples, models, guarantees, permits, licenses,
unloading facilities and services, temporary utilities, protection of adjacent work that has been installed by other trades, repair or
replacement of work damaged by Subcontractor, and all other items necessary for the proper performance of the Work.
   Subcontractor shall pay for all inspection fees, royalties, and license fees relating to the Work and shall make all necessary
arrangements and agreements so as not to infringe any patents, trademarks, and copyrights.
   PERFORMANCE AND PAYMENT BONDS ARE NOT REQUIRED
   All Work shall be performed in a skillful and workmanlike manner with material, equipment, etc. being new and of the best kind and
grade for the purpose intended.

3. Payment
   The Contractor agrees to pay the Subcontractor, the total sum of
   TBD
   for actual work performed to the satisfaction of Contractor, subject to additions and deductions by Change Order. Progress
payments will be made monthly in an amount equal to the estimated value of the labor, materials, and equipment incorporated into
the construction and the estimated value of the materials and equipment suitably stored at the Project site, less previous payments and less retainage; progress payments shall not become due to the Subcontractor until ten (10) days after receipt by the Contractor of his payment from the Owner for such labor, materials, and equipment. Unless Subcontractor submits its written application in a form satisfactory to Contractor at least five (5) days prior to the thirtieth (30th) day of each month, no progress payment shall be payable for such payment period. All payment applications are subject to audit by Contractor and any payment may be withheld or denied pending substantiation by audit. Any estimate by Contractor of the value of Work performed during a payment period or of the amount any deduction, offset or counterclaim relating to the Work shall be binding on Subcontractor.

Retainage in a sum equal to five percent (5%) of each progress payment shall be withheld, without interest, by Contractor until final payment. Final payment shall become payable thirty (30) days after final completion and acceptance of the Project. Prior to each payment Subcontractor shall submit from each of its sub-Subcontractors and suppliers written lien releases. Acceptance of any progress payments by Subcontractor shall constitute a release of Contractor from any other liability, except retainage, arising or incurred during the payment period. Acceptance of final payment by Subcontractor constitutes a general release of Contractor and its surety. All payments are subject to withholding by Contractor, without interest, of any amount reasonably necessary to fully protect Contractor against any actual or potential liability or damage directly or indirectly relating to the Work or this Subcontract, or against Subcontractor's breach or threatened breach hereof. Payments may be withheld on account of (1) defective work not remedied, (2) claims filed, (3) failure of Subcontractor to make payments for labor, materials, or equipment, (4) damage to the Contractor or another Subcontractor, or (5) persistent failure to carry out the Work in accordance with the Contract Documents. No payment shall be construed as an acceptance of defective or incomplete Work, and subcontractor shall remain responsible and liable for strict compliance with this Subcontract and the Prime Contract.

Subcontractor hereby waives and releases any and all claims and causes of action for payment in addition to the contract price.

4. **Mutuality of Documents.**

Subcontractor hereby acknowledges that it has carefully reviewed and examined all documents directly or indirectly relating to this Subcontract, that any and all known ambiguities and discrepancies have previously been clarified and/or corrected, and that no conditions exist which would affect the progress, performance or price of this Subcontract. Subcontractor further acknowledges that Plumbing, Mechanical, Fire Protection, and Electrical Drawings are diagrammatical in nature and may require detailed coordination with these trades in the normal course of completing Subcontractor's work. Such coordination is included in the price of this Subcontract Agreement.

5. **Laws, Regulations, Etc.**

The Work shall strictly comply with all federal, state, and local laws, rules, regulations, statues, ordinances and directives (hereafter designated as “Laws”), including but not limited to labor laws, laws covering safety, licensing laws and bonding laws. Subcontractor agrees to indemnify and save Contractor, and Owner harmless from and against any and all claims, loss or expense caused or occasioned directly or indirectly by its failure to fully comply with any and all such Laws.

6. **Extra Work or Change Orders.**

Subcontractor shall, within seven (7) days after discovery of a required scope modification or receipt of a request by Contractor, submit a complete and detailed price quotation for proposed changes. No extra work, alterations or deviations from this Subcontract shall be performed or allowed without the written change orders signed by Contractor, and no obligation, express or implied, is assumed by Contractor for any work done without such written consent. Any change or adjustment in the subcontract price shall be agreed to by Contractor and Subcontractor and shall be set forth in such change order; if no such agreement can be reached, Subcontractor shall perform the extra work and Contractor will pay for such work performed and materials furnished by Subcontractor in an amount equal to the actual cost thereof plus zero percent (0%) of said cost in which event Subcontractor shall prepare daily time and material invoices which shall be submitted to Contractor on a daily basis. In no event shall Subcontractor's overhead and profit percentages exceed the maximum allowed to Contractor or Subcontractor in Contractor's agreement with Owner. Daily time and material invoices shall include any direct out-in-pocket material and labor costs, plus the percentage mark-up. Contractor and Subcontractor agree that any such extra, changed or additional work performed by Subcontractor shall be performed pursuant to and in accordance with all the terms and conditions of this Subcontract. Any extension of time needed as the result of the proposed change orders shall be requested by Subcontractor, in writing, prior to the issuance of such change order and shall be incorporated therein. Ordinary field modifications which do not substantially increase Subcontractor's cost of this Subcontract will be performed without any price or time adjustment. No change orders shall vary, abrogate, avoid or otherwise affect the terms, conditions or provisions of this Subcontract except as specifically set forth in the change order.

7. **Scheduling.**

Time is of the essence in the performance of the work specified in this Subcontract. Subcontractor agrees to prosecute the work, at such times and in such order as the Contractor considers necessary to avoid any delay in the completion of the Project as a whole. Subcontractor shall comply with the following schedule:

Per Bid Documents and as scheduled by Project Manager or Jobsite Superintendent. Contact Roger Davis at 585.3420.

If no schedule is set forth above, Subcontractor agrees to begin the work within _3_ calendar days after being notified in writing by the Contractor to proceed and to complete work no later than _3_ calendar days after notice to proceed by Contractor.

Subcontractor shall timely submit all samples, drawings and information required for approval by Contractor no more than twenty (20) days from award or as otherwise stated in this Agreement, and to place all orders for materials in ample time for delivery, and
to employ sufficient men and equipment to complete the Work in ample time for Contractor to complete its work in accordance with the construction schedule.

If in the opinion of Contractor the Subcontractor falls behind in the progress schedule, Subcontractor shall take such steps as may be necessary to improve the subcontract work progress, and Contractor may require Subcontractor to increase the number of shifts and/or over-time operations, days of work, work weekends and holidays, and/or increase the equipment or tools being used, and to submit for approval such supplementary schedule or schedules as may be necessary to demonstrate the manner in which the agreed rate of progress will be regained, all without additional cost to Contractor. If Subcontractor should delay or threaten to delay the progress or performance of this Subcontract, or cause any delay or actual or potential damage or liability to Contractor, then Subcontractor may be deemed in breach of this Subcontract and shall indemnify and hold Contractor harmless from any penalties, liability and/or damages, and shall promptly pay to Contractor any such costs, penalties, liabilities or damages so incurred, including attorney fees.

Subcontractor shall fully cooperate and coordinate the Work with Contractor and any other contractor or subcontractor at the Project in scheduling and performance of work so as to avoid conflict or interference with the work of others. Subcontractor shall bear the costs of all damages to other subcontractors and shall be directly responsible to such other contractors or Subcontractor.

The Contractor shall not be liable to the Subcontractor for delay to the Subcontractor's work by the act, neglect or default of any person, or by reason of fire or other casualty, or on account of riots or of strikes, or other combined action of the workmen or others, or on account of any acts of God, or any other cause beyond Contractor's control, or on account of any circumstances caused or contributed to by the Subcontractor.

In the event any other subcontractor should interfere with the Work or damage Subcontractor, Subcontractor shall neither seek nor be entitled to any compensation from Contractor, but will seek its damages directly from such other party. Subcontractor acknowledges that the contract price herein is based on the fact that Contractor is not liable to Subcontractor, absent any actual fraud or intentional and active tortious act, for any damages or costs due to delays, accelerations, nonperformance, interferences with performance, suspensions or changes in the performance or sequence of Subcontractor's work.

8. **Safety.**

Subcontractor shall, at its own expense, conform to the basic safety policy of Contractor including Subcontractor Site Safety Requirements and Procedures manual attached to this Agreement, comply with all specific safety requirements promulgated by any governmental authority and comply with all state and federal safety laws, including, but not limited to the Montana Safety Culture Act, the Montana Safety Act, Occupational Safety and Health Act of 1970 or its successor, and the Construction Safety Act of 1969 or its successor, as the same may be amended from time to time. In addition, Subcontractor agrees to require its employees and sub-subcontractors to abide by all other safety requirements imposed by Contractor or the project Owner. In the event of a dispute over any safety regulation, Subcontractor and its employees shall follow the instructions given by Contractor's job superintendent. If Subcontractor causes Contractor to incur any fine or penalty resulting from the failure of Subcontractor or its employees or sub-subcontractors to comply with OSHA regulations or the Construction Safety Act, Subcontractor hereby agrees to defend and to hold Contractor harmless from, and to employ sufficient men and equipment to complete the Work in ample time for Contractor to complete its work in accordance with the construction schedule.

If in the opinion of Contractor the Subcontractor falls behind in the progress schedule, Subcontractor shall take such steps as may be necessary to improve the subcontract work progress, and Contractor may require Subcontractor to increase the number of shifts and/or over-time operations, days of work, work weekends and holidays, and/or increase the equipment or tools being used, and to submit for approval such supplementary schedule or schedules as may be necessary to demonstrate the manner in which the agreed rate of progress will be regained, all without additional cost to Contractor. If Subcontractor should delay or threaten to delay the progress or performance of this Subcontract, or cause any delay or actual or potential damage or liability to Contractor, then Subcontractor may be deemed in breach of this Subcontract and shall indemnify and hold Contractor harmless from any penalties, liability and/or damages, and shall promptly pay to Contractor any such costs, penalties, liabilities or damages so incurred, including attorney fees.

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The Contractor shall not be liable to the Subcontractor for delay to the Subcontractor's work by the act, neglect or default of any person, or by reason of fire or other casualty, or on account of riots or of strikes, or other combined action of the workmen or others, or on account of any acts of God, or any other cause beyond Contractor's control, or on account of any circumstances caused or contributed to by the Subcontractor.

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Subcontractor shall fully cooperate and coordinate the Work with Contractor and any other contractor or subcontractor at the Project in scheduling and performance of work so as to avoid conflict or interference with the work of others. Subcontractor shall bear the costs of all damages to other subcontractors and shall be directly responsible to such other contractors or Subcontractor.

The Contractor shall not be liable to the Subcontractor for delay to the Subcontractor's work by the act, neglect or default of any person, or by reason of fire or other casualty, or on account of riots or of strikes, or other combined action of the workmen or others, or on account of any acts of God, or any other cause beyond Contractor's control, or on account of any circumstances caused or contributed to by the Subcontractor.

In the event any other subcontractor should interfere with the Work or damage Subcontractor, Subcontractor shall neither seek nor be entitled to any compensation from Contractor, but will seek its damages directly from such other party. Subcontractor acknowledges that the contract price herein is based on the fact that Contractor is not liable to Subcontractor, absent any actual fraud or intentional and active tortious act, for any damages or costs due to delays, accelerations, nonperformance, interferences with performance, suspensions or changes in the performance or sequence of Subcontractor's work.
subcontractors, its suppliers or its employees, and (b) claims or disputes of any person or entity for damages from any cause
directly or indirectly relating to any action or failure to act by Subcontractor, its representatives, its employees, its subcontractors or
its suppliers, including but not limited to inaccurate surveys, failure to properly perform or interpret tests, and inspection errors, to
the extent that the liability, damages, losses or costs are caused by the negligence, recklessness, or intentional misconduct of a
third party or of Subcontractor or its officers, employees or agents.

The Subcontractor agrees to indemnify the contractor against and hold the contractor harmless for any and all expenses, suits, and
actions (including attorney’s fees) for or on account of any injury to any person, or any death at any time resulting from such injury,
or any damage to any property, which may arise (or which may be alleged to have arisen) out of or in connection with the work
covered by this Subcontract to the extent such injury, death or damage may be (or may be alleged to be) attributable to the
negligence, recklessness, or intentional misconduct of a third party or of Subcontractor or its officers, its employees or its agents.
The Subcontractor agrees to reimburse the Contractor for all sums which the Contractor may pay or be compelled to pay in
settlement of any claim hereunder, including any claim under the provisions of any worker’s compensation law or any plan for
employees’ benefits which the Contractor may adopt.

Contractor may retain any and all monies due or to become due to Subcontractor, under this or any other contract, sufficient to
save itself harmless and protect itself against any such liability or damage, including attorney fees.

Subcontractor acknowledges that specific consideration has been received by it for these indemnifications.

12. Insurance.

Subcontractor shall maintain full and complete insurance and additional insured status on its work for a minimum of one year after
final payment, until the end of the warranty period, or such other longer period as may be required by the Contract Documents, in
the following amounts:

**Workers Compensation:** Claims for damages because of bodily injury, occupational sickness or disease or death of
employees

- Workers Compensation Statutory
- Each Accident $1,000,000
- Disease Policy Limit $1,000,000
- Disease-Each Person $1,000,000

Worker’s Compensation, including occupational disease and employer’s liability insurance shall cover all Subcontractor’s
employees and company owners directly engaged in the performance of this Subcontract. Montana Contractors Exemption
only allowed for company owners not directly performing work at the jobsite

**Commercial General Liability:** Claims for damages because of bodily injury or property damage to third parties.

Insurance shall include:

- Premises-Operations
- Products-Completed
- Contractual Liability
- Personal and Advertising Injury
- No Exclusion for Blanket Explosion, Collapse, and Underground Property Damage
- Operations of Independent Contractors
- No exclusion for injury to subcontractor’s employees
- No exclusion for residential, habitational or multi-family work
- Per project aggregate limit endorsement
- Waiver of subrogation in favor of contractor
- Minimum Policy Limits:
  - General Aggregate $2,000,000
  - Products/Completed Operations $2,000,000
  - Personal & Advertising Injury $1,000,000
  - Each Occurrence Limit $1,000,000

In respect to the Commercial General Liability insurance which Subcontractor is obligated to purchase by the foregoing
provisions, Subcontractor agrees to cause, at its sole expense, General Contractor, to be named as Additional Insured’s under
said policy or policies of insurance for both ongoing and completed operations using ISO Forms CG 3287 and CG 3290 or
equivalent. Subcontractor’s insurance policy shall be considered primary insurance without recourse to or contribution from
any similar insurance carried by subcontractor.

**Automobile Liability:** Claims for damages because of bodily injury or death of any person, or any property damage arising
out of the ownership or use of any motor vehicle.

Insurance shall include:
13. **Assignment.**

Subcontractor shall not assign this Subcontract or any monies due hereunder without Contractor's written consent.

14. **Liens and Encumbrances.**

Subcontractor agrees to promptly pay all of its laborers, materials suppliers and sub-subcontractors and, in the event any of them file a lien against the project, to promptly remove the lien, by payment or bond.

15. **Taxes, Charges, Etc.**

Subcontractor shall pay the following taxes and fees, which are included in the Contract price:

- None apply.

16. **Labor Relations.**

Subcontractor shall take all necessary action to assure harmonious labor relations at the Project and to avoid or that will permit the work to be carried on harmoniously and without delay, and that will not cause any disturbance, interference, or delay to the progress of the Project. Subcontractor agrees to discharge any employee objected to by Contractor upon reasonable grounds.

In the prosecution of all work covered by this Subcontract, or on this Project, the Subcontractor agrees to recognize and comply with all agreements of the Contractor with local building trade councils and/or separate unions concerning labor and working conditions and otherwise, applicable to this work, insofar as these agreements do not conflict with or violate any local, state or federal laws or properly constituted orders or regulations.

The Subcontractor agrees that where his work or the Contractor's work is stopped or delayed or interfered with by strikes, slow-downs, or work interruptions resulting from the acts or failure to act of the employees of the Subcontractor or by any breach of the provisions above, then the Contractor, at his option, may terminate this Subcontract; the Contractor shall have the remedies provided for herein even though the Subcontractor's employees may be engaging in work stoppage solely as a result of a labor dispute involving the Contractor or others and not in any manner involving the Subcontractor. Whether or not this Subcontract is terminated, Subcontractor shall be liable to Contractor for all damages, costs and expenses, including attorney fees, incurred by reason of any delay, interference, injury or damages suffered as a result thereof.

17. **Breaches.**

Occurrence of any of the following conditions may be deemed by Contractor to be a material breach of this Subcontract by Subcontractor:

- **(a)** Subcontractor fails to comply with any one of the provisions of this Subcontract, or fails to perform in accordance with the Prime Contract.
- **(b)** Subcontractor fails to properly prosecute and perform any part of its work in a timely manner.
- **(c)** Subcontractor becomes involved in labor disputes, or is listed or causes Contractor to be listed by the administrator of any union trust fund or by any union as delinquent in payment of wages or fringe benefits.
(d) Subcontractor is adjudged a bankrupt, or makes a general assignment for the benefit of creditors, or a receiver is appointed to take over Subcontractor's business or assets, or Subcontractor becomes insolvent, is unable to, or fails to, pay its obligations as they mature.

In case of breach, Subcontractor and its surety company shall be liable to Contractor for any and all additional costs, expenses, attorney fees and other damages, both liquidated and unliquidated, which directly or indirectly result from Subcontractor's breach or threatened breach. Subcontractor shall also be responsible and liable for all costs and expenses, including attorney fees, and any assessment of liquidated or other damages incurred by Contractor if Contractor pursues any extra, change, addition, claim or dispute against any other party on behalf of Subcontractor or as a result of Contractor's defending or taking part in any action or proceeding which directly or indirectly relates to acts or omissions of Subcontractor or its subcontractors or suppliers.

If Subcontractor is in breach of this Subcontract, the Contractor shall have the right to notify Subcontractor by certified mail of the breach. If the Contractor determines that Subcontractor has not remedied and cured the default or defaults in its performance within three (3) days, then the Contractor may, at its option, without releasing or waiving its rights and remedies against the Subcontractor's sureties and without prejudice to any other right it may be entitled to hereunder or by law, terminate this Subcontract and take possession of the work and all materials, tools, equipment, and appliances of the Subcontractor and finish the Subcontractor's work by whatever means, method or agency which the Contractor may, in its sole discretion, choose, or without terminating this Subcontract, take any steps the Contractor deems advisable to secure any labor, materials, equipment, and services, and shall have a lien on and may take over all of Subcontractor's equipment, tools, appliances and materials and may prosecute the work to completion. In the event that the Contractor deems any of the foregoing remedies necessary, the Subcontractor agrees that it shall not be entitled to receive any further payment until after the Project shall have been completed. Moreover, all monies expended and all of the costs, losses, damages and extra expenses, including all management, administrative and other overhead and other direct and indirect expenses (including attorney's fees) incurred by the Contractor incident to such completion, shall be deducted from the Subcontract sum herein stated, and if such expenditures, together with said costs, losses, damages and extra expenses, exceed the unpaid balance of the Subcontract sum, the Subcontractor agrees to pay promptly to the Contractor, on demand, the full amount of such excess, including costs of collection, attorney's fees and interest thereon at the maximum legal rate of interest per annum until paid.

The Contractor's determination of the Subcontractor's default or defaults and the Contractor's decision as to the Subcontractor's failure to remedy and cure said default or defaults upon notification of their existence, made by the Contractor in good faith, shall be conclusive as to the Contractor's right to proceed as herein provided. The liability of the Subcontractor hereunder shall extend to and include the full amount of any and all sums paid, expenses and losses incurred, damages sustained, and obligations assumed by the Contractor in good faith under the belief that such payments or assumptions were necessary or required, whether actually necessary or required or not, (a) in completing the work and providing labor, materials, equipment, supplies and other items therefor or reletting the Subcontract, and (b) in settlement, discharge or compromise of any claims, demands, suits and judgments pertaining to or arising out of the work hereunder. A sworn itemized statement thereof or the checks or other evidence of payment shall be prima facie evidence of the fact and extent of Subcontractor's liability.

In addition to the cost of completion paid by Contractor, Subcontractor agrees to pay an amount equal to twenty percent (20%) of such cost of completion to cover Contractor's overhead in respect thereto. Whenever any monies are expended or costs or expenses are incurred by Contractor on behalf of or on account of Subcontractor, which Subcontractor should have paid and for which Subcontractor is required to reimburse Contractor, or if Contractor continues or completes the Work after default by Subcontractor, Subcontractor shall pay to Contractor interest at the maximum rate permitted by law from the time said monies or said costs or expenses are incurred until the same are paid to Contractor by Subcontractor. Nothing herein contained shall be construed as requiring Contractor to make any such expenditures, advance any such monies, or incur any such expenses.

18. Termination for Convenience.

Upon seven days written notice to the Subcontractor, the Contractor may, without cause and without prejudice to any other right of Contractor, terminate the Subcontract. In such case the Subcontractor shall be paid for (without duplication of any item):

1. completed and acceptable Work executed in accordance with the Subcontract prior to the effective date of termination;

2. reasonable expenses directly attributable to termination.

The Subcontractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from the termination.


Any notice which Contractor desires to or is required to give to Subcontractor may be delivered to Subcontractor's representative or may be delivered or mailed to Subcontractor at the address set forth in this Subcontract. Such notice shall be deemed served upon actual delivery or upon being deposited in the United States mail so addressed, and postage thereon prepaid.

20. Subcontractors and Suppliers.

Montana State University – New Dining Hall BP 2B
Example GC/CM Subcontractor Agreement
Mosaic Architecture
00 5500 - 6
At the time of commencing the Work, Subcontractor shall submit to Contractor a complete written list of all sub-subcontractors and suppliers and their current addresses. Subcontractor further agrees to notify Contractor of any additions, deletions or changes in said list within five (5) days of any such changes.

21. **Guarantee.**

Subcontractor agrees to guarantee its work for a period of one (1) year from the date of completion of the Project. Subcontractor shall remove, replace and/or repair at its own expense defective workmanship, materials and equipment which shall fail to develop ratings, capacities or characteristics required by this Subcontract, or the Contract documents, at any time within a period of one (1) year after acceptance of the Project or within such longer period thereafter as may be provided in the Prime Contract and related documents, if due to Subcontractor's negligence or error. Subcontractor shall also pay all costs necessary to remove, replace and/or repair any other work which may be damaged in removing, replacing or repairing any portion of the Work for which Subcontractor is responsible.

Contractor may demand assurance, by bond or otherwise, from Subcontractor that it will abide by its guarantee and warranty as specified herein and as might otherwise be specified to a greater extent in the Prime Contract.

22. **Governing Law.**

The validity, interpretation and performance of this Subcontract shall be governed by the laws of the State of Montana. If any term or provision of this Subcontract is found invalid, it shall not affect the valid enforcement of all remaining terms and provisions of this Subcontract.

23. **Contract Modifications.**

This Subcontract cannot be changed, modified or amended except in writing executed by all parties. This Subcontract supersedes all prior representations, understandings or agreements except as expressly stated herein. This Subcontract shall be binding upon the heirs, successors, administrators and assigns of the parties hereto.

24. **Failure to Sign Agreement.**

In the event Subcontractor has failed to sign and return to Contractor a copy of this Subcontract after having received a copy hereof from Contractor, and the Subcontractor enters upon performance of the Work, such performance shall be deemed Subcontractor's consent and agreement to be bound by all the terms and conditions of this Subcontract.

25. **Attorney Fees.**

In the event Contractor is required to employ an attorney or bring legal action to enforce this Subcontract or to take any action in respect thereto, or to defend any action arising out of Subcontractor's operations hereunder, Subcontractor agrees in any such event to pay Contractor's reasonable costs and attorney fees, including costs and fees on any appeal.

26. **Miscellaneous.**

None.

CONTRACTOR                                                                                       SUBCONTRACTOR

Signature ___________________________                                                                 Signature ___________________________

(Stephen T. Langlas)                                                                                     

Title: President                                                                                     Title: ___________________________
for the following PROJECT:

(Owner information)

THE OWNER:

(Owner information)

THE ARCHITECT:

(Architect information)

THE OWNER:

(Owner information)

THE ARCHITECT:

(Architect information)

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ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An Additions and Deletions Report that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.
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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 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 and certify termination of the Agreement under Section 14.2.2.

§ 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.
§ 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.

§ 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 will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment 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 this Project is not to be construed as publication in derogation of the Architect’s or Architect’s consultants’ reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them 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 material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect’s consultants.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM
If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

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.

§ 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 INFORMATION AND SERVICES REQUIRED OF THE OWNER
§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner’s obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner’s ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or
the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§2.2.2 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.

§2.2.3 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.

§2.2.4 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.

§2.2.5 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.

§2.3 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.

§2.4 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 written 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 deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor 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. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

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 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 2.2.3, 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 make 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 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, 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 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, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and 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 written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required 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 authorized by the Architect in accordance with Sections 3.12.8 or 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.

§ 3.4.3 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.

§ 3.5 WARRANTY
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.

§ 3.6 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.

§ 3.7 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 21 days after first observance of the conditions. 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 an equitable adjustment 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 in writing, stating the reasons. If either party disputes the Architect’s determination or recommendation, that party may 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 furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply 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 SCHEDULES
§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner’s and Architect’s information a Contractor’s construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect’s approval. The Architect’s approval shall not unreasonably be 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, 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 maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be 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 the way by which 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 requirements of the Contract Documents by the Architect’s approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing 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 written 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. 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 cause such services or certifications to be provided by a properly 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, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, 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. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 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, and 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 and patching shall be restored to the condition existing prior to the cutting, fitting and 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 such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor’s 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 or 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 Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 ACCESS TO WORK
The Contractor shall provide the Owner and Architect 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 such 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 the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such 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 Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. 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.

§ 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.

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

§ 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 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, 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 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, except as provided in Section 3.3.1.

§ 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 report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) 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 FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect’s consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 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 13.5.2 and 13.5.3, whether or not such 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, material and equipment 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, unless otherwise specifically stated by the Architect, 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 authorize 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 duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 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 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 or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply within the 14-day period shall constitute notice of no reasonable objection.

§ 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 previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 SUBCONTRACTUAL RELATIONS

By appropriate agreement, written where legally required for validity, 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, which the Contractor, by these 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 in writing; 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 such 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 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 Owner reserves the right to perform construction or operations related to the Project with the Owner’s own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 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 other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction 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, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor 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 report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report 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, except as to defects not then reasonably discoverable.

§ 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 the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors 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, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 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
§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 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.

§ 7.3.6 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.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and 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 7.3.7 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;
.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
.5 Additional costs of supervision and field office personnel directly attributable to the change.

§ 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 has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

[Note: The text continues with further details on the processes and considerations for minor changes in the Work, including the role of the Architect and the implications for the Owner and Contractor.]
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, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 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 an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor’s control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order 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
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.

§ 9.2 SCHEDULE OF VALUES
Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor’s 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. Such application shall be notarized, if required, and supported by such data substantiating the Contractor’s right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material 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 material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 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, material suppliers, or other persons or entities making a claim by reason of having 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 issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect’s reasons for withholding certification in whole or in part 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 comprising the Application for Payment, that, to the best of the Architect’s knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. 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. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. 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 material 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 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 make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may 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 not remedied;
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;
§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 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 material or equipment suppliers 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 Architect will reflect such payment on the next Certificate 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 material and equipment 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 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, except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment 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 and 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, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 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’ written notice to the Owner and Architect,
§ 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, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall 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 such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such 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.

§ 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 as required under Section 11.3.1.5 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 written 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 and, when the

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 shut-down, delay and start-up, plus interest as provided for in the Contract Documents.
§ 10.2.1 SAFETY OF PERSONS AND PROPERTY

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 or the Contractor's Subcontractors or Sub-
   subcontractors; 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.
§ 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 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 owners and users of adjacent sites and utilities.

§ 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, except damage or loss 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 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, written notice of such 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

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. 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 report the condition to the Owner and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor’s written 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 such material or substance or who are to perform the task of removal or safe containment of such 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 in the amount of the Contractor’s reasonable additional costs of shut-down, 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 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.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for 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 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 indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance 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 indemnify the Contractor for all cost and expense thereby incurred.

§ 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 LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor’s operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

.1 Claims under workers’ compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;
.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor’s employees;
.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor’s employees;
.4 Claims for damages insured by usual personal injury liability coverage;
.5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
.6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
.7 Claims for bodily injury or property damage arising out of completed operations; and
.8 Claims involving contractual liability insurance applicable to the Contractor’s obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor’s completed operations coverage, until the expiration of the period for correction
of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days’ prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents 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 during the Contractor’s completed operations.

§ 11.2 OWNER’S LIABILITY INSURANCE
The Owner shall be responsible for purchasing and maintaining the Owner’s usual liability insurance.

§ 11.3 PROPERTY INSURANCE
§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder’s risk “all-risk” or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an “all-risk” or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect’s and Contractor’s services and expenses required as a result of such insured loss.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or
otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

§ 11.3.2 BOILER AND MACHINERY INSURANCE
The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

§ 11.3.3 LOSS OF USE INSURANCE
The Owner, at the Owner’s option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner’s property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner’s property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 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, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days’ prior written notice has been given to the Contractor.

§ 11.3.7 WAIVERS OF SUBROGATION
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, and (2) the Architect, Architect’s consultants, separate contractors described in Article 6, 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 covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect’s consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner’s property insurance 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 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner’s duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the

User Notes:
Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner’s exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND
§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

§ 11.4.2 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.

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, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner’s expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor’s expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK
§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION
The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after 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 an 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 written 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 2.4.
§ 12.2.2 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.

§ 12.2.3 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.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors 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.

§ 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 except that, 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 such 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 such assignment.

§ 13.3 WRITTEN NOTICE
Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 RIGHTS AND REMEDIES
§ 13.4.1 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.

§ 13.4.2 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 there under, except as may be specifically agreed in writing.
§ 13.5 TESTS AND INSPECTIONS
§ 13.5.1 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 (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 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 13.5.1, 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 13.5.3, shall be at the Owner’s expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 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.

§ 13.5.4 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.

§ 13.5.5 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.

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

§ 13.6 INTEREST
Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may 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.

§ 13.7 TIME LIMITS ON CLAIMS
The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, 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 13.7.

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 or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, 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 promptly, upon the Contractor’s request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, 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’ written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor 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’ written 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 for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;

.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 above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, 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’ written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.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 as described in 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 written 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 Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the 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, 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.

§ 15.1.2 NOTICE OF CLAIMS
Claims by either the Owner or Contractor must be initiated by written 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 must 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 CONTINUING CONTRACT PERFORMANCE
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. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST
If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME
§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein 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.

§ 15.1.5.2 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.
§ 15.1.6 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 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, 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 arising prior to the date final payment is due unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no 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 such 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 an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, 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 15.1.6 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 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 parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, 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.

§ 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 Either party, at its sole discretion, 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 Either party, at its sole discretion, 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 the Owner and Contractor under this Agreement.
List of Contract Forms for Subcontract Administration

The following is a list of Contract Administration Forms to be used in this Project. No others will be accepted unless noted otherwise. Hard copies of these forms will be available at the first scheduled preconstruction meeting. Electronic forms are available through Langlas & Associates. Contact Matt Drake at mattdrake@langlas.com

- Change Order Request- Langlas COR Form, per specification 00 7200
- Construction Change Directive- Langlas CCD Form or emailed directive, per specification 00 7200
- Construction Change Order- Langlas Subcontract Change Order Form, per specification 00 7200
- Proposal Request- AIA G704 as issued by Architect
- Application and Certificate for Payment- Per specification 00 7210
- Certified Payroll- US Department of Labor Form WH347 or Subcontractors own form contained identical information
- RFI and Submittal Distribution- RFI’s, submittals and closeout documentation will be handled electronically. Subcontractors will be required to submit Information Requests and Submittal information electronically. Further instruction will be available at the first scheduled preconstruction meeting.

END OF LIST OF CONTRACT FORMS
INSURANCE REQUIREMENTS PACKET:

Before commencing work, the Subcontractor shall procure and maintain in force the insurance coverage’s outlined below, and provide evidence of such coverage by submitting to Langlas & Associates, Inc. an original and appropriate Certificate of Insurance (See attached sample). The insurance carrier or carriers must be rated at least A- or better by A.M. Best or an acceptable State Fund for Workers Compensation Coverage.

**Workers Compensation & Employers Liability:** Shall extend to all employees and company owners directly engaged in named insured’s operations except for company owners not directly performing work at the jobsite and 2nd tier subcontractors. Proof of coverage to be provided in the following limits:

- Workers compensation Statutory
- Employers Liability Limits
  - $1,000,000 Each Accident
  - $1,000,000 Disease- Policy Limit
  - $1,000,000 Disease- Each Employee

**Commercial General Liability Insurance:** Claims for damages because of bodily injury or property damage to third parties. Insurance shall include:

- Premises-Operations
- Products-Completed Operations
- Contractual Liability
- Personal and Advertising Injury
- No Exclusion for Blanket Explosion, Collapse, and Underground Property Damage:
- Operations of Independent Contractors
- No exclusion for injury to subcontractor's employees
- No exclusion for residential, habitational or multi-family work
- Per project aggregate limit endorsement
- Waiver of subrogation in favor of contractor

Minimum Policy Limits:

- General Aggregate $2,000,000
- Products/Completed Operations $2,000,000
- Personal & Advertising Injury $1,000,000
- Each Occurrence Limit $1,000,000
In respect to the public liability and property damage insurance which Subcontractor is obligated to purchase by the foregoing provisions, Subcontractor agrees to cause, at its sole expense, Langlas & Associates, Inc., to be named as Additional Insured’s under said policy or policies of insurance for both ongoing and completed operations using ISO Forms CG 3287 and CG 3290 or equivalent.

Subcontractor's insurance policy shall be considered primary insurance without recourse to or contribution from any similar insurance carried by subcontractor. Subcontractor shall maintain coverage and additional insured status for a minimum of one year after final payment, until the end of the warranty period, or such other longer period as may be required by the Contract Documents.

**Automobile Liability:** Claims for damages because of bodily injury or death of any person, or any property damage arising out of the ownership or use of any motor vehicle. Insurance coverage shall include comprehensive Automobile Liability insurance including owned, hired and non-owned vehicles with limits of $1,000,000 or greater, combined single limit for each occurrence for bodily injury and death, or property damage.

**Cancellation Notice:** Subcontractor shall provide notice of any material change, non-renewal or cancellation of insurance within 30 days of such change or notice. Maintenance of proper insurance coverage is a material element of this agreement and failure to maintain or renewal coverage may be treated as a material breach of contract. However, failure to maintain required insurance does not modify or release Subcontractor from any other obligation under this contract.

**Certificates:**
Depending on the Langlas & Associates office location providing the subcontract agreement, the certificate holder/additional insured shall respectively read:

**Billings Office:**
Langlas & Associates, Inc.
2270 Grant Rd.
Billings, MT 59102

**Bozeman Office:**
Langlas & Associates, Inc.
1019 E. Main St. Suite 101
Bozeman, MT 59715

If you have any questions regarding the insurance requirements, please contact our agent:

First West, Inc.
Bryan Hall
1905 Stadium Drive
Bozeman, MT 59715
bryan@fstwest.com
406-587-5111
**ACORD CERTIFICATE OF LIABILITY INSURANCE**

**THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFRS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.**

**IMPORTANT:** If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. 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).

**PRODUCER**
First West, Inc.
PO Box 1800
1900 Stadium Dr
Bozeman, MT 59715
Bryan D. Hall, CIC
406-587-5111
406-587-9162

**CONTACT**
NAME: [Redacted]
PHONE: [Redacted]
FAX: [Redacted]

**INSURED**
SUBCONTRACTOR'S NAME
ADDRESS
CITY, ST ZIP

1) **Does the named insured match the name on your subcontract agreement?**

2) **Are limits accurate?**

3) **Are the policy dates current?**

4) **Are Additional Insured and Waiver of Subrogation boxes checked?**

5) **Is the Per Project Gen'l Aggregate Limit box checked?**

6) **Is the Auto a Commercial Auto Policy?**

7) **Is Langlas & Associates, Inc. an additional insured for both Ongoing and Completed Operations? Is it noted?**

**CERTIFICATE HOLDER**
Langlas & Associates, Inc.
2270 Grant Rd
Billings, MT 59102

**CANCELLATION**

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

Authorized Representative
Bryan D. Hall, CIC

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**PPA #15-0103**
Subcontractor Insurance Requirements
Contract Modification Procedures for Modification of Subcontract Agreement

Outlined below are administrative and procedural requirements for handling and processing Subcontract modifications to Contract Sum or Contract Time.

MINOR CHANGES IN THE WORK

Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, “Architect’s Supplemental Instructions” or similar form. These will be distributed by the Construction Manager to Subcontractors accordingly.

PROPOSAL REQUESTS

Owner-initiated Proposal Requests: Architect will issue a detailed description of proposed change in the Work that may require adjustment to the Contract Sum or the Contract Time on AIA G704 or similar. If necessary, the description will include supplemental or revised Drawings and Specifications. These documents will be distributed by the Construction Manager to Subcontractors accordingly.

1. Proposal Requests issued by Architect or Construction Manager are not instructions either to stop work in progress or to execute the proposed change.
2. Within the time specified in the Proposal Request or as requested by Construction Manager, submit an itemized quotation estimated cost adjustments to the Contract Sum or Contract Time necessary to execute the change. This quotation is to be completed on the Construction Managers “Change Request Form” or Subcontractors own form containing identical information. Submit this form to Construction Manager for review.

SUBCONTRACTOR-INITIATED PROPOSALS

If latent or changed conditions require modifications to the Subcontract, Subcontractor may initial a claim by submitted a Change Request Form to the Construction Manager.

1. Include all the information required by the Change Request Form including a description of the change, reference RFI(s), and the effect on Contract Sum and Contract Time.
2. Include a detailed, itemized list of materials, quantities and unit costs.
3. Include a detailed breakdown on labor requirements and corresponding wage rates.
4. Include a detailed breakdown of equipment, delivery charges, 2nd tier subcontract modifications and/or other requirements.
5. Show any applicable credits for labor, material or equipment as separate line items from additional costs.
6. Sign, date and transmit document to Construction Manager for review.

Upon submission of the Change Request Form by Subcontractor, Construction Manager will review the proposed change with the Owner’s Representative, Architect and any of the Architects Consultants to review the content and merit of the proposed change. Upon Owner acceptance of the change, Construction Manager will issue to Subcontractor a Construction Change Directive or Subcontract Change Order

CONSTRUCTION CHANGE DIRECTIVE

Upon acceptance of the proposed change in Contract Sum or Contract Time, Construction Manager may issue a Construction Change Directive either in the form of a signed CCD Form or an email directing the Subcontractor to proceed with the work in question. This directive and associated adjustments to Contract Sum or Contract Time will be included in subsequent Change Order.

1. Subcontractor is not to proceed with any change in work without written documentation from Construction Manager as outlined above.
SUBCONTRACT CHANGE ORDER

Pending issue of Prime Contract Change Order by Architect, Construction Manager will issue to Subcontractor a formal signed change order summarizing the change in work and subsequent modification to Contract Sum and/or Contract Time.

1. Upon receipt of a signed Subcontractor Change Order, Subcontractor may include the change as a separate line item on their AIA billing document.

2. Change Order can be billed out on a basis of percentage of change order work completed.

END OF SUBCONTRACT MODIFICATION PROCEDURES
MONTANA PREVAILING WAGE RATES FOR BUILDING CONSTRUCTION SERVICES 2016

Effective: January 2, 2016

Steve Bullock, Governor
State of Montana

Pam Bucy, Commissioner
Department of Labor and Industry

To obtain copies of prevailing wage rate schedules, or for information relating to public works projects and payment of prevailing wage rates, visit ERD at www.mtwagehourbopa.com or contact:

Employment Relations Division
Montana Department of Labor and Industry
P. O. Box 201503
Helena, MT 59620-1503
Phone 406-444-5600
TDD 406-444-5549

The Labor Standards Bureau welcomes questions, comments and suggestions from the public. In addition, we'll do our best to provide information in an accessible format, upon request, in compliance with the Americans with Disabilities Act.

MONTANA PREVAILING WAGE REQUIREMENTS

The Commissioner of the Department of Labor and Industry, in accordance with Sections 18-2-401 and 18-2-402 of the Montana Code Annotated (MCA), has determined the standard prevailing rate of wages for the occupations listed in this publication.

The wages specified herein control the prevailing rate of wages for the purposes of Section 18-2-401, et seq., MCA. It is required that each employer pay (as a minimum) the rate of wages, including fringe benefits, travel allowance, zone pay and per diem applicable to the district in which the work is being performed as provided in the attached wage determinations.

All Montana Prevailing Wage Rates are available on the internet at www.mtwagehourbopa.com or by contacting the Labor Standards Bureau at (406) 444-5600 or TDD (406) 444-5549.

In addition, this publication provides general information concerning compliance with Montana’s Prevailing Wage Law and the payment of prevailing wages. For detailed compliance information relating to public works contracts and payment of prevailing wage rates, please consult the regulations on the internet at www.mtwagehourbopa.com or contact the Labor Standards Bureau at (406) 444-5600 or TDD (406) 444-5549.

PAM BUCY
Commissioner
Department of Labor and Industry
State of Montana
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A. Date of Publication January 2, 2016

B. Definition of Building Construction
For the purposes of Prevailing Wage, the Commissioner of Labor and Industry has determined that building construction occupations are defined to be those performed by a person engaged in a recognized trade or craft, or any skilled, semi-skilled, or unskilled manual labor related to the construction, alteration, or repair of a public building or facility, and does not include engineering, superintendence, management, office or clerical work.

The Administrative Rules of Montana (ARM), 24.17.501(2) – 2(a), states “Building construction projects generally are the constructions of sheltered enclosures with walk-in access for housing persons, machinery, equipment, or supplies. It includes all construction of such structures, incidental installation of utilities and equipment, both above and below grade level, as well as incidental grading, utilities and paving.

Examples of building construction include, but are not limited to, alterations and additions to buildings, apartment buildings (5 stories and above), arenas (closed), auditoriums, automobile parking garages, banks and financial buildings, barracks, churches, city halls, civic centers, commercial buildings, court houses, detention facilities, dormitories, farm buildings, fire stations, hospitals, hotels, industrial buildings, institutional buildings, libraries, mausoleums, motels, museums, nursing and convalescent facilities, office buildings, out-patient clinics, passenger and freight terminal buildings, police stations, post offices, power plants, prefabricated buildings, remodeling buildings, renovating buildings, repairing buildings, restaurants, schools, service stations, shopping centers, stores, subway stations, theaters, warehouses, water and sewage treatment plants (buildings only), etc.”

C. Definition of Public Works Contract
Section 18-2-401(11)(a), MCA defines “public works contract” as “…a contract for construction services let by the state, county, municipality, school district, or political subdivision or for nonconstruction services let by the state, county, municipality, or political subdivision in which the total cost of the contract is in excess of $25,000…”.

D. Prevailing Wage Schedule
This publication covers only Building Construction occupations and rates. These rates will remain in effect until superseded by a more current publication. Current prevailing wage rate schedules for Heavy Construction, Highway Construction, and Nonconstruction Services occupations can be found on the internet at www.mtwagehourbopa.com or by contacting the Labor Standards Bureau at (406) 444-5600 or TDD (406) 444-5549.

E. Rates to Use for Projects
ARM, 24.17.127(1)(c), states “The wage rates applicable to a particular public works project are those in effect at the time the bid specifications are advertised.”

F. Wage Rate Adjustments for Multiyear Contracts
Section 18-2-417, MCA states:

“(1) Any public works contract that by the terms of the original contract calls for more than 30 months to fully perform must include a provision to adjust, as provided in subsection (2), the standard prevailing rate of wages to be paid to the workers performing the contract.

(2) The standard prevailing rate of wages paid to workers under a contract subject to this section must be adjusted 12 months after the date of the award of the public works contract. The amount of the adjustment must be a 3% increase. The adjustment must be made and applied every 12 months for the term of the contract.

(3) Any increase in the standard rate of prevailing wages for workers under this section is the sole responsibility of the contractor and any subcontractors and not the contracting agency.”
G. Fringe Benefits
Section 18-2-412, MCA states:

“(1) To fulfill the obligation...a contractor or subcontractor may:

(a) pay the amount of fringe benefits and the basic hourly rate of pay that is part of the standard prevailing rate of wages directly to the worker or employee in cash;

(b) make an irrevocable contribution to a trustee or a third person pursuant to a fringe benefit fund, plan, or program that meets the requirements of the Employee Retirement Income Security Act of 1974 or that is a bona fide program approved by the U. S. department of labor; or

(c) make payments using any combination of methods set forth in subsections (1)(a) and (1)(b) so that the aggregate of payments and contributions is not less than the standard prevailing rate of wages, including fringe benefits and travel allowances, applicable to the district for the particular type of work being performed.

(2) The fringe benefit fund, plan, or program described in subsection (1)(b) must provide benefits to workers or employees for health care, pensions on retirement or death, life insurance, disability and sickness insurance, or bona fide programs that meet the requirements of the Employee Retirement Income Security Act of 1974 or that are approved by the U. S. department of labor.”

Fringe benefits are paid for all hours worked (straight time and overtime hours). However, fringe benefits are not to be considered a part of the hourly rate of pay for calculating overtime, unless there is a collectively bargained agreement in effect that specifies otherwise.

H. Prevailing Wage Districts
Montana counties are aggregated into 4 districts for the purpose of prevailing wage. The prevailing wage districts are composed of the following counties:

**Montana Prevailing Wage Districts**
I. Dispatch City
ARM, 24.17.103(11), defines dispatch city as “...the courthouse in the city from the following list which is closest to the center of the job: Billings, Bozeman, Butte, Great Falls, Helena, Kalispell, and Missoula.” A dispatch city shall be considered the point of origin only for jobs within the counties identified in that district (as shown below):

- **District 1 – Kalispell and Missoula**: includes Flathead, Lake, Lincoln, Mineral, Missoula, Ravalli, and Sanders;
- **District 2 – Butte and Helena**: includes Beaverhead, Broadwater, Deer Lodge, Glacier, Granite, Jefferson, Lewis and Clark, Liberty, Madison, Pondera, Powell, Silver Bow, Teton, and Toole;
- **District 3 – Bozeman and Great Falls**: includes Blaine, Cascade, Chouteau, Fergus, Gallatin, Golden Valley, Hill, Judith Basin, Meagher, Park, Petroleum, Phillips, Sweet Grass, and Wheatland;
- **District 4 – Billings**: includes Big Horn, Carbon, Carter, Custer, Daniels, Dawson, Fallon, Garfield, McCona, Musselshell, Powder River, Prairie, Richland, Roosevelt, Rosebud, Sheridan, Stillwater, Treasure, Valley, Wibaux, and Yellowstone.

J. Zone Pay
Zone pay is not travel pay. ARM, 24.17.103(24), defines zone pay as “...an amount added to the base pay; the combined sum then becomes the new base wage rate to be paid for all hours worked on the project. Zone pay must be determined by measuring the road miles one way over the shortest practical maintained route from the dispatch city to the center of the job.” See section I above for a list of dispatch cities.

K. Computing Travel Benefits
ARM, 24.17.103(22), states “Travel pay, also referred to as ‘travel allowance,’ is and must be paid for travel both to and from the job site, except those with special provisions listed under the classification. The rate is determined by measuring the road miles one direction over the shortest practical maintained route from the dispatch city or the employee's home, whichever is closer, to the center of the job.” See section I above for a list of dispatch cities.

L. Per Diem
ARM, 24.17.103(18), states “Per diem typically covers costs associated with board and lodging expenses. Per diem is paid when an employee is required to work at a location outside the daily commuting distance and is required to stay at that location overnight or longer.”

M. Apprentices
Wage rates for apprentices registered in approved federal or state apprenticeship programs are contained in those programs. Additionally, Section 18-2-416(2), MCA states “...The full amount of any applicable fringe benefits must be paid to the apprentice while the apprentice is working on the public works contract.” Apprentices not registered in approved federal or state apprenticeship programs will be paid the appropriate journey level prevailing wage rate when working on a public works contract.

N. Posting Notice of Prevailing Wages
Section 18-2-406, MCA provides that contractors, subcontractors and employers who are “...performing work or providing construction services under public works contracts, as provided in this part, shall post in a prominent and accessible site on the project or staging area, not later than the first day of work and continuing for the entire duration of the project, a legible statement of all wages and fringe benefits to be paid to the employees.”

O. Employment Preference
Sections 18-2-403 and 18-2-409, MCA requires contractors to give preference to the employment of bona fide Montana residents in the performance of work on public works contracts.

P. Building Construction Occupations Website
You can find definitions for these occupations on the following Bureau of Labor Statistics website: http://www.bls.gov/oes/current/oes_stru.htm

Q. Welder Rates
Welders receive the rate prescribed for the craft performing an operation to which welding is incidental.

R. Foreman Rates
Rates are no longer set for foremen. However, if a foreman performs journey level work, the foreman must be paid at least the journey level rate.
## WAGE RATES

### BOILERMakers

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
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<td>$30.00</td>
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<td>$30.30</td>
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<tr>
<td>District 4</td>
<td>$30.00</td>
<td>$30.30</td>
</tr>
</tbody>
</table>

**Duties Include:**
Construct, assemble, maintain, and repair stationary steam boilers and boiler house auxiliaries.

**Travel:**
- **All Districts**
  - 0-120 mi. free zone
  - >120 mi. federal mileage rate/mi. in effect when travel occurs.

**Special Provision:**
Travel is paid only at the beginning and end of the job.

**Per Diem:**
- **All Districts**
  - 0-70 mi. free zone
  - >70-120 mi. $55.00/day
  - >120 mi. $70.00/day

### BRICK, BLOCK, AND STONE MASONS

<table>
<thead>
<tr>
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</tr>
<tr>
<td>District 4</td>
<td>$26.05</td>
<td>$13.19</td>
</tr>
</tbody>
</table>

**Travel:**
- **All Districts**
  - 0-45 mi. free zone
  - >45-60 mi. $25.00/day
  - >60-90 mi. $55.00/day
  - >90 mi. $65.00/day

### CARPENTERS

<table>
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<tbody>
<tr>
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<td>District 4</td>
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</table>

**Zone Pay:**
- **All Districts**
  - 0-30 mi. free zone
  - >30-60 mi. base pay + $4.00/hr.
  - >60 mi. base pay + $6.00/hr.

**Duties Include:**
Install roll and batt insulation, and hardwood floors.

### CEMENT MASONS AND CONCRETE FINISHERS

<table>
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<tr>
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<td>$21.44</td>
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**Zone Pay:**
- **All Districts**
  - 0-30 mi. free zone
  - >30-60 mi. base pay + $2.95/hr.
  - >60 mi. base pay + $4.75/hr.

**Duties Include:**
Smooth and finish surfaces of poured concrete, such as floors, walks, sidewalks, or curbs. Align forms for sidewalks, curbs, or gutters.
## CONSTRUCTION EQUIPMENT OPERATORS GROUP 1

<table>
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<tr>
<td>4</td>
<td>$23.47</td>
<td>$11.05</td>
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</table>

This group includes but is not limited to:
- Air Compressor; Auto Fine Grader; Belt Finishing; Boring Machine (Small); Cement Silo; Crane, A-Frame Truck Crane; Crusher Conveyor; DW-10, 15, and 20 Tractor Roller; Farm Tractor; Forklift; Form Grader; Front-End Loader, under 1 cu. yd; Oiler, Heavy Duty Drills; Herman Nelson Heater; Mucking Machine; Oiler, All Except Cranes/Shovels; Pumpman.

### Zone Pay:
- **All Districts**
  - 0-30 mi. free zone
  - >30-60 mi. base pay + $3.50/hr.
  - >60 mi. base pay + $5.50/hr.

## CONSTRUCTION EQUIPMENT OPERATORS GROUP 2

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</tr>
<tr>
<td>4</td>
<td>$23.94</td>
<td>$11.05</td>
</tr>
</tbody>
</table>

This group includes but is not limited to:
- Air Doctor; Backhoe\Excavator\Shovel, up to and incl. 3 cu. yds; Bit Grinder; Bituminous Paving Travel Plant; Boring Machine, Large; Broom, Self-Propelled; Concrete Travel Batcher; Concrete Float & Spreader; Concrete Bucket Dispatcher; Concrete Finish Machine; Concrete Conveyor; Distributor; Dozer, Rubber-Tired, Push, & Side Boom; Elevating Grader\Gradall; Field Equipment Serviceman; Front-End Loader, 1 cu. yd up to and incl. 5 cu. yds; Grade Setter; Heavy Duty Drills, All Types; Hoist\Tugger, All; Hydralift Forklifts & Similar; Industrial Locomotive; Motor Patrol (except finish); Mountain Skidder; Oiler, Cranes/Shovels; Pavement Breaker, EMSCO; Power Saw, Self-Propelled; Pugmill; Pumpcrete\Grout Machine; Punch Truck; Roller, other than Asphalt; Roller, Sheepsfoot (Self-Propelled); Roller, 25 tons and over; Ross Carrier; Rotomill, under 6 ft; Trenching Machine; Washing /Screening Plant.

### Zone Pay:
- **All Districts**
  - 0-30 mi. free zone
  - >30-60 mi. base pay + $3.50/hr.
  - >60 mi. base pay + $5.50/hr.
## CONSTRUCTION EQUIPMENT OPERATORS GROUP 3

<table>
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<tr>
<td>District 4</td>
<td>$24.34</td>
<td>$11.05</td>
</tr>
</tbody>
</table>

This group includes but is not limited to:
- Asphalt Paving Machine; Asphalt Screed;
- Backhoe; Excavator; Shovel, over 3 cu. yds; Cableway Highline;
- Concrete Batch Plant; Concrete Curing Machine; Concrete Pump; Cranes, Creter; Cranes, Electric Overhead; Cranes, 24 tons and under; Curb Machine; Slip Form Paver; Finish Dozer; Front-End Loader, over 5 cu. yds; Mechanic; Welder; Pioneer Dozer; Roller Asphalt (Breakdown & Finish); Rotomill, over 6 ft; Scraper, Single, Twin, or Pulling Belly-Dump; YO-YO Cat.

### Zone Pay:
- **All Districts**
  - 0-30 mi. free zone
  - >30-60 mi. base pay + $3.50/hr.
  - >60 mi. base pay + $5.50/hr.

## CONSTRUCTION EQUIPMENT OPERATORS GROUP 4

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$25.00</td>
<td>$11.05</td>
</tr>
<tr>
<td>District 2</td>
<td>$25.00</td>
<td>$11.05</td>
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<tr>
<td>District 3</td>
<td>$25.00</td>
<td>$11.05</td>
</tr>
<tr>
<td>District 4</td>
<td>$25.00</td>
<td>$11.05</td>
</tr>
</tbody>
</table>

This group includes but is not limited to:
- Asphalt; Hot Plant Operator; Cranes, 25 tons up to and incl. 44 tons; Crusher Operator; Finish Motor Patrol; Finish Scraper.

### Zone Pay:
- **All Districts**
  - 0-30 mi. free zone
  - >30-60 mi. base pay + $3.50/hr.
  - >60 mi. base pay + $5.50/hr.

## CONSTRUCTION EQUIPMENT OPERATORS GROUP 5

<table>
<thead>
<tr>
<th>District</th>
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<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
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<td>$11.05</td>
</tr>
<tr>
<td>District 2</td>
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<td>$11.05</td>
</tr>
<tr>
<td>District 4</td>
<td>$25.50</td>
<td>$11.05</td>
</tr>
</tbody>
</table>

This group includes but is not limited to:
- Cranes, 45 tons up to and incl. 74 tons.

### Zone Pay:
- **All Districts**
  - 0-30 mi. free zone
  - >30-60 mi. base pay + $3.50/hr.
  - >60 mi. base pay + $5.50/hr.
### CONSTRUCTION EQUIPMENT OPERATORS GROUP 6

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$26.60</td>
<td>$11.05</td>
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<tr>
<td>2</td>
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<td>$11.05</td>
</tr>
<tr>
<td>4</td>
<td>$26.60</td>
<td>$11.05</td>
</tr>
</tbody>
</table>

This group includes but is not limited to:
Cranes, 75 tons up to and incl. 149 tons; Cranes, Whirley (All).

### CONSTRUCTION EQUIPMENT OPERATORS GROUP 7

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>$11.05</td>
</tr>
<tr>
<td>4</td>
<td>$27.10</td>
<td>$11.05</td>
</tr>
</tbody>
</table>

This group includes but is not limited to:
Cranes, 150 tons up to and incl. 250 tons; Cranes, over 250 tons—add $1.00 for every 100 tons over 250 tons; Crane, Tower (All); Crane Stiff-Leg or Derrick; Helicopter Hoist.

### CONSTRUCTION LABORERS GROUP 1 / FLAG PERSON FOR TRAFFIC CONTROL

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$17.35</td>
<td>$8.04</td>
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<tr>
<td>2</td>
<td>$18.00</td>
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<td>3</td>
<td>$18.00</td>
<td>$7.24</td>
</tr>
<tr>
<td>4</td>
<td>$18.00</td>
<td>$7.24</td>
</tr>
</tbody>
</table>

This group includes but is not limited to:
General Labor; Laborers; Flag Person for Traffic Control.

### Zone Pay:

- **All Districts**
  - 0-30 mi. free zone
  - >30-60 mi. base pay + $3.50/hr.
  - >60 mi. base pay + $5.50/hr.
## CONSTRUCTION LABORERS GROUP 2

<table>
<thead>
<tr>
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<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$16.27</td>
<td>$6.18</td>
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<tr>
<td>District 2</td>
<td>$17.47</td>
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<tr>
<td>District 3</td>
<td>$16.28</td>
<td>$6.25</td>
</tr>
<tr>
<td>District 4</td>
<td>$18.00</td>
<td>$6.61</td>
</tr>
</tbody>
</table>

This group includes but is not limited to:
- General Labor; Asbestos Removal; Burning Bar; Bucket Man; Carpenter Tender; Caisson Worker; Cement Mason Tender; Cement Handler (dry); Chuck Tender; Choker Setter; Concrete Worker; Curb Machine-lay Down; Crusher and Batch Worker; Heater Tender; Fence Erector; Landscape Laborer; Landscaper; Lawn Sprinkler Installer; Pipe Wrapper; Pot Tender; Powderman Tender; Rail and Truck Loaders and Unloaders; Riprapper; Sign Erection; Guardrail and Jersey Rail; Spike Driver; Stake Jumper; Signalman; Tail Hoseman; Tool Checker and Houseman and Traffic Control Worker.

### Zone Pay:
- **District 1**
  - 0-30 mi. free zone
  - >30-60 mi. base pay + $1.50/hr.
  - >60 mi. base pay + $3.90/hr.
- **District 2**
  - 0-15 mi. free zone
  - >15-30 mi. base pay + $1.55/hr.
  - >30-50 mi. base pay + $3.10/hr.
  - >50 mi. base pay + $4.65/hr.
- **Districts 3 & 4**
  - 0-15 mi. free zone
  - >15-30 mi. base pay + $0.65/hr.
  - >30-50 mi. base pay + $0.85/hr.
  - >50 mi. base pay + $1.25/hr.

## CONSTRUCTION LABORERS GROUP 3

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
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<tr>
<td>District 2</td>
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<tr>
<td>District 3</td>
<td>$19.00</td>
<td>$7.24</td>
</tr>
<tr>
<td>District 4</td>
<td>$19.00</td>
<td>$7.24</td>
</tr>
</tbody>
</table>

This group includes but is not limited to:
- Concrete Vibrator; Dumpman (Graderman); Equipment Handler; Geotextile and Liners; High-Pressure Nozzleman; Jackhammer (Pavement Breaker) Non-Riding Rollers; Pipelayer; Posthole Digger (Power); Power Driven Wheelbarrow; Rigger; Sandblaster; Sod Cutter-Power and Tamper.

### Zone Pay:
- **Districts 1 & 2**
  - 0-30 mi. free zone
  - >30-60 mi. base pay + $1.50/hr.
  - >60 mi. base pay + $3.90/hr.
- **Districts 3 & 4**
  - 0-15 mi. free zone
  - >15-30 mi. base pay + $0.65/hr.
  - >30-50 mi. base pay + $0.85/hr.
  - >50 mi. base pay + $1.25/hr.
CONSTRUCTION LABORERS GROUP 4

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$17.14</td>
<td>$6.80</td>
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<tr>
<td>District 2</td>
<td>$23.49</td>
<td>$8.70</td>
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<tr>
<td>District 3</td>
<td>$22.53</td>
<td>$7.64</td>
</tr>
<tr>
<td>District 4</td>
<td>$21.02</td>
<td>$8.01</td>
</tr>
</tbody>
</table>

This group includes but is not limited to:
Hod Carrier***; Water Well Laborer; Blaster; Wagon Driller; Asphalt Raker; Cutting Torch; Grade Setter; High-Scaler; Power Saws (Faller & Concrete) Powderman; Rock & Core Drill; Track or Truck Mounted Wagon Drill and Welder incl. Air Arc.

***Hod Carriers will receive the same amount of travel and/or subsistence pay as bricklayers when requested to travel.

Zone Pay:
District 1
0-30 mi. free zone
>30-60 mi. base pay + $1.50/hr.
>60 mi. base pay + $3.90/hr.

District 2
0-15 mi. free zone
>15-30 mi. base pay + $1.55/hr.
>30-50 mi. base pay + $3.10/hr.
>50 mi. base pay + $4.65/hr.

Districts 3 & 4
0-15 mi. free zone
>15-30 mi. base pay + $0.65/hr.
>30-50 mi. base pay + $0.85/hr.
>50 mi. base pay + $1.25/hr.

DRYWALL APPLICATORS

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$22.00</td>
<td>$11.57</td>
</tr>
<tr>
<td>District 2</td>
<td>$22.00</td>
<td>$11.86</td>
</tr>
<tr>
<td>District 3</td>
<td>$22.00</td>
<td>$11.57</td>
</tr>
<tr>
<td>District 4</td>
<td>$22.00</td>
<td>$11.57</td>
</tr>
</tbody>
</table>

Duties Include:
Drywall and ceiling tile installation.

Zone Pay:
All Districts
0-30 mi. free zone
>30-50 mi. base pay + $4.00/hr.
>50 mi. base pay + $6.00/hr.
ELECTRICIANS: INCLUDING BUILDING AUTOMATION CONTROL

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
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<td>$11.61</td>
</tr>
<tr>
<td>District 4</td>
<td>$31.39</td>
<td>$12.72</td>
</tr>
</tbody>
</table>

Duties Include:
Electrical wiring; equipment and fixtures; street lights; electrical control systems. Installation and/or adjusting of building automation controls also during testing and balancing, commissioning and retro-commissioning.

Travel:
District 1
No mileage due when traveling in employer’s vehicle.

The following travel allowance is applicable when traveling in employee’s vehicle:
- 0-10 mi. free zone
- >10-45 mi. $0.585/mi. in excess of the free zone.
- >45 mi. $75.00/day

District 2
No mileage due when traveling in employer’s vehicle.

The following travel allowance is applicable when traveling in employee’s vehicle:
- 0-08 mi. free zone
- >08-50 mi. federal mileage rate/mi. in excess of the free zone.
- >50 mi. $64.00/day

District 3
No mileage due when traveling in employer’s vehicle.

The following travel allowance is applicable when traveling in employee’s vehicle:
- 0-08 mi. free zone
- >08-50 mi. federal mileage rate/mi. in excess of the free zone.
- >50 mi. $64.00/day

District 4
No mileage due when traveling in employer’s vehicle.

The following travel allowance is applicable when traveling in employee’s vehicle:
- 0-18 mi. free zone
- >18-60 mi. $38.90/day
- >60 mi. $75.00/day

ELEVATOR CONSTRUCTORS

<table>
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<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
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<tr>
<td>District 1</td>
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<td>$34.08</td>
</tr>
<tr>
<td>District 4</td>
<td>$48.59</td>
<td>$34.08</td>
</tr>
</tbody>
</table>

Travel:
All Districts
0-15 mi. free zone
>15-25 mi. $38.90/day
>25-35 mi. $77.79/day
>35 mi. $84.90/day or cost of receipts for hotel and meals, whichever is greater.
FLOOR LAYERS

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
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<tbody>
<tr>
<td>1</td>
<td>$18.36</td>
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<tr>
<td>2</td>
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<tr>
<td>3</td>
<td>$18.36</td>
<td>No Rate Established</td>
</tr>
<tr>
<td>4</td>
<td>$18.36</td>
<td>No Rate Established</td>
</tr>
</tbody>
</table>

Lay and install carpet from rolls or blocks on floors. Install padding and trim flooring materials.

GLAZIERS

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$18.50</td>
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<tr>
<td>2</td>
<td>$17.71</td>
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<tr>
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HEATING AND AIR CONDITIONING

<table>
<thead>
<tr>
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<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>$15.39</td>
</tr>
<tr>
<td>4</td>
<td>$27.33</td>
<td>$15.39</td>
</tr>
</tbody>
</table>

Duties Include:
Testing and balancing, commissioning and retro-commissioning of all air-handling equipment and duct work.

Travel:
- All Districts
  - 0-50 mi. free zone
  - >50 mi.
    - $0.25/mi. in employer vehicle
    - $0.65/mi. in employee vehicle

Per Diem:
- All Districts
  - $65.00/day

INSULATION WORKERS - MECHANICAL (HEAT AND FROST)

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>$18.47</td>
</tr>
<tr>
<td>4</td>
<td>$27.67</td>
<td>$18.47</td>
</tr>
</tbody>
</table>

Duties Include:
Insulate pipes, ductwork or other mechanical systems.

Travel:
- All Districts
  - 0-30 mi. free zone
  - >30-40 mi. $20.00/day
  - >40-50 mi. $30.00/day
  - >50-60 mi. $40.00/day
  - >60 mi. $45.00/day plus
    - $0.56/mi. if transportation is not provided.
    - $0.20/mi. if in company vehicle.
  - >60 mi. $77.00/day on jobs requiring an overnight stay plus
    - $0.56/mi. if transportation is not provided.
    - $0.20/mi. if in company vehicle.

* Corrected 01/22/2016
### IRONWORKERS - STRUCTURAL STEEL AND REBAR PLACERS

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$26.90</td>
<td>$20.99</td>
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<tr>
<td>2</td>
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<td>$19.98</td>
</tr>
<tr>
<td>4</td>
<td>$26.50</td>
<td>$19.98</td>
</tr>
</tbody>
</table>

**Duties Include:**
Structural steel erection; assemble prefabricated metal buildings; cut, bend, tie, and place rebar; energy producing windmill type towers; metal bleacher seating; handrail fabrication and ornamental steel.

**Travel:**
- **District 1**
  - 0-45 mi. free zone
  - >45-60 mi. $30.00/day
  - >60-100 mi. $55.00/day
  - >100 mi. $75.00/day
- **Districts 2, 3 & 4**
  - 0-45 mi. free zone
  - >45-85 mi. $45.00/day
  - >85 mi. $75.00/day

### MILLRIGHTS

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>$11.57</td>
</tr>
<tr>
<td>4</td>
<td>$31.00</td>
<td>$11.57</td>
</tr>
</tbody>
</table>

**Zone Pay:**
- **All Districts**
  - 0-30 mi. free zone
  - >30-50 mi. base pay + $4.00/hr.
  - >50 mi. base pay + $6.00/hr.

### PAINTERS: INCLUDING PAPERHANGERS

<table>
<thead>
<tr>
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<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$23.14</td>
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</tr>
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<td>2</td>
<td>$23.14</td>
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<tr>
<td>3</td>
<td>$19.70</td>
<td>$8.11</td>
</tr>
<tr>
<td>4</td>
<td>$19.25</td>
<td>$11.78</td>
</tr>
</tbody>
</table>

**Travel:**
- **All Districts**
  - 0-120 mi. free zone
  - >120 mi. $45.00/day

### PILE BUCKS

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<tr>
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<td>$11.86</td>
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<tr>
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</tr>
<tr>
<td>4</td>
<td>$28.00</td>
<td>$11.57</td>
</tr>
</tbody>
</table>

**Zone Pay:**
- **All Districts**
  - 0-30 mi. free zone
  - >30-50 mi. base pay + $4.00/hr.
  - >50 mi. base pay + $6.00/hr.

**Duties Include:**
Set up crane; set up hammer; weld tips on piles; set leads; insure piles are driven straight with the use of level or plum bob. Give direction to crane operator as to speed and direction of swing. Cut piles to grade.
### PLASTERERS

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
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<tr>
<td>District 2</td>
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</tr>
<tr>
<td>District 4</td>
<td>$21.44</td>
<td>$  7.14</td>
</tr>
</tbody>
</table>

**Zone Pay:**

- **All Districts**
  - 0-30 mi. free zone
  - >30-60 mi. base pay + $2.95/hr.
  - >60 mi. base pay + $4.75/hr.

---

### PLUMBERS, PIPEFITTERS, AND STEAMFITTERS

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
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<td>District 1</td>
<td>$27.53</td>
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</tr>
<tr>
<td>District 2</td>
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<td>$13.73</td>
</tr>
<tr>
<td>District 4</td>
<td>$30.21</td>
<td>$16.01</td>
</tr>
</tbody>
</table>

**Travel:**

- **District 1**
  - 0-30 mi. free zone
  - >30-50 mi. $20.00/day
  - >50-75 mi. $35.00/day
  - >75 mi. $70.00/day

**Special Provision:**

- If transportation is not provided, an additional $0.35/mi. is added to the amounts above for travel at the beginning and end of job, not for every mile traveled.

**Districts 2 & 3**

- 0-40 mi. free zone
- >40-80 mi. $30.00/day
- >80 mi. $60.00/day

**Special Provision:**

- If employer provides transportation, travel pay will be ½ of the amounts listed above unless the employee stays overnight. If the employee chooses to stay overnight, the employee will receive the full amount of travel listed above even if the employer furnishes transportation.

**District 4**

- 0-70 mi. free zone
- >70 mi.
  - $90.00/day if transportation is provided.
  - $90.00/day + $0.55/mi. (for one trip, there and back) if transportation is not provided.
**ROOFERS**

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
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</tr>
<tr>
<td>District 4</td>
<td>$21.28</td>
<td>$  3.72</td>
</tr>
</tbody>
</table>

**Travel:**
- **District 1**
  - 0-50 mi. free zone
  - >50 mi. $0.30/mi.
- **Districts 2, 3 & 4**
  - No travel established.

**Per Diem:**
- **Districts 2 & 3**
  - Employer pays for room + $25.00/day.
- **Districts 1 & 4**
  - No per diem established.

**SHEET METAL WORKERS**

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
<td>$27.33</td>
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</tr>
<tr>
<td>District 2</td>
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</tr>
<tr>
<td>District 3</td>
<td>$27.33</td>
<td>$15.39</td>
</tr>
<tr>
<td>District 4</td>
<td>$27.33</td>
<td>$15.39</td>
</tr>
</tbody>
</table>

**Duties Include:**
Testing and balancing, commissioning and retro-commissioning of all air-handling equipment and duct work. Manufacture, fabrication, assembling, installation, dismantling, and alteration of all HVAC systems, air veyer systems, and exhaust systems. All lagging over insulation and all duct lining. Metal roofing.

**Travel:**
- **All Districts**
  - 0-50 mi. free zone
  - >50 mi.:
    - $0.25/mi. in employer vehicle
    - $0.65/mi. in employee vehicle

**Per Diem:**
- **All Districts**
  - $65.00/day

**SPRINKLER FITTERS**

<table>
<thead>
<tr>
<th>District</th>
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<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>District 1</td>
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<tr>
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<td>$18.37</td>
</tr>
<tr>
<td>District 4</td>
<td>$30.71</td>
<td>$18.37</td>
</tr>
</tbody>
</table>

**Duties Include:**
Duties Include but not limited to any and all fire protection systems: Installation, dismantling, inspection, testing, maintenance, repairs, adjustments, and corrections of all fire protection and fire control systems, including both overhead and underground water mains, all piping, fire hydrants, standpipes, air lines, tanks, and pumps used in connection with sprinkler and alarm systems.

**Travel:**
- **All Districts**
  - 0-60 mi. free zone
  - >60-80 mi. $16.50/day
  - >80-100 mi. $26.50/day
  - >100 mi. $80.00/day

* Corrected 01/22/2016
TAPERS

<table>
<thead>
<tr>
<th>District</th>
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<th>Benefit</th>
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</tr>
<tr>
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<tr>
<td>3</td>
<td>$23.14</td>
<td>$8.11</td>
</tr>
<tr>
<td>4</td>
<td>$23.14</td>
<td>$8.11</td>
</tr>
</tbody>
</table>

Travel:

- All Districts
  - 0-120 mi. free zone
  - >120 mi. $45.00/day

TEAMSTERS GROUP 2 (TRUCK DRIVERS)

<table>
<thead>
<tr>
<th>District</th>
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<th>Benefit</th>
</tr>
</thead>
<tbody>
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<td>3</td>
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</tr>
<tr>
<td>4</td>
<td>$27.69</td>
<td>$9.16</td>
</tr>
</tbody>
</table>

Zone Pay:

- All Districts
  - 0-25 mi. free zone
  - >25-50 mi. base pay + $2.50/hr.
  - >50 mi. base pay + $4.00/hr.

This group includes but is not limited to:
- Combination Truck and Concrete Mixer and Transit Mixer
- Dry Batch Trucks
- Distributor Driver
- Dumpman
- Dump Trucks and similar equipment
- Dumpster
- Flat Trucks
- Lumber Carriers
- Lowboys
- Pickup
- Powder Truck Driver
- Power Boom
- Serviceman
- Service Truck/Fuel Truck/Tireperson
- Truck Mechanic
- Trucks with Power Equipment
- Warehouseman, Partsman, Cardex and Warehouse Expeditor
- Water Trucks

TELECOMMUNICATIONS EQUIPMENT INSTALLERS

<table>
<thead>
<tr>
<th>District</th>
<th>Wage</th>
<th>Benefit</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>4</td>
<td>$22.08</td>
<td>$5.71</td>
</tr>
</tbody>
</table>

Travel:

- All Districts
  - The federal mileage rate/mi. in effect when travel occurs if using own vehicle.

Per Diem:

- All Districts
  - Employer pays for meals and lodging up to $65.00/day.
  - When jobsite is located in Big Sky, West Yellowstone and Gardiner, lodging and meals will be provided by the employer for all actual and reasonable expenses incurred.

Duties Include:
- Install voice; sound; vision and data systems. This occupation includes burglar alarms, fire alarms, fiber optic systems, and video systems for security or entertainment.

TILE AND MARBLE SETTERS

No Rate Established

Duties Include:
- Apply hard tile, marble, and wood tile to floors, ceilings, and roof decks
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- Boring Location Map (Figure 1)
- Logs of Exploratory Borings (Figures 2 through 6)
- Laboratory Test Data (Figures 7 through 14)
- Construction Standard No. 02801-06C
- Soil Classification and Sampling Terminology for Engineering Purposes
- Classification of Soils for Engineering Purposes
The geotechnical investigation for the dining hall to be located on West Harrison Street at Montana State University, encountered lean clay underlain by poorly-graded gravel with sand. The seismic site class is D, and the risk of seismically-induced liquefaction or soil settlement is considered low and does not warrant additional evaluation. The primary geotechnical concern regarding this project is the presence of weak compressible soils at the anticipated bearing elevation for the structure. The site is suitable for the use of conventional shallow foundations bearing on 18-inches of compacted structural fill with a recommended allowable bearing of 2,500 pounds per square foot provided the recommendations included in this report are followed.
2.0 INTRODUCTION

2.1 Purpose and Scope

This report presents the results of our geotechnical study for the new dining hall to be located at 900 West Harrison Street on the Montana State University campus in Bozeman, Montana. The purpose of the geotechnical study is to determine the general surface and subsurface conditions at the proposed site and to develop geotechnical engineering recommendations for support of the proposed structure and design of related facilities. This report describes the field work and laboratory analyses conducted for this project, the surface and subsurface conditions encountered, and presents our recommendations for the proposed foundations and related site development.

Our field work included drilling five soil borings across the proposed site. Samples were obtained from the borings and returned to our Great Falls laboratory for testing. Laboratory testing was performed on selected soil samples to determine engineering properties of the subsurface materials. The information obtained during our field investigations and laboratory analyses was used to develop recommendations for the design of the proposed foundation systems.

This study is in general accordance with the proposal submitted by Kyle Scarr, PE of our firm. Our work was authorized to proceed by Mr. Jeff Downhour, AIA of Mosaic Architecture by his signed acceptance of our proposal.

2.2 Project Description

It is our understanding that the proposed project consists of, in part, a single-story structure incorporating a full-depth basement being approximately 160 by 170 feet in plan. Nearby structures are known to be supported on deep foundations; however, these structures are generally multi-story structures with significant higher structural loads. In our opinion, the use of conventional shallow foundations is a viable option which needs to be considered for this project. Structural loads had not been developed at the time of this report. However, for the purpose of our analysis, we have assumed that wall loads will be less than 3,000 pounds per lineal foot and column loads, if any, will be less than 50 kips. If the assumed design values presented above vary from the actual project parameters, the recommendations presented in this report should be reevaluated. Site development will most likely include landscaping, exterior concrete flatwork and asphalt and Portland cement concrete pavements for access and loading dock driveways.
3.0 SITE CONDITIONS

3.1 Geology and Physiography

The site is geologically characterized as containing upper tertiary sediment according to the Montana Bureau of Mines and Geology (MBMG), Geologic Map of Montana. Generally, the surface is composed of varying thicknesses of silt and/or clay deposits overlying alluvial fan deposits of well-graded gravel with sand. The gravel is predominantly subrounded to angular and contains cobbles and minor amounts of silt and/or clay. Reportedly, the local alluvial fan deposits extend down to of at least 165 feet.

Based on the subsurface conditions encountered and the limited depth of investigation, the site falls under seismic Site Class D. The appropriate 2009 International Building Code (IBC) seismic design parameters for the site include site coefficients of 1.20 and 1.94 for F_a and F_v, respectively. The recommended design spectral response accelerations at short periods (SD_s) and at 1-second period (SD_1) are 0.751g and 0.231g, respectively. These values represent two-thirds of the mapped response accelerations following correction for the appropriate site classification. The likelihood of seismically-induced soil liquefaction or settlement for this project is low and does not warrant additional evaluation.

3.2 Surface Conditions

The proposed project site is located on the Montana State University campus at 900 West Harrison Street in Bozeman, Montana. This site presently consists of two modular buildings, an asphalt pad that previously housed additional modular buildings and various landscaping.
on background information and site observations, the site slopes downward toward the north at slopes ranging from one to three percent. The topography is best described as gently sloping.

3.3 Subsurface Conditions

3.3.1 Soils

The subsurface soil conditions appear to be relatively consistent based on our exploratory drilling, and soil sampling. In general, the subsurface soil conditions encountered within the borings consist of approximately fifteen to nineteen feet of lean clay underlain by very dense gravel with sand which extends to a depth of at least 31.5 feet, the maximum depth investigated.

The subsurface soils are described in detail on the enclosed boring logs and are summarized below. The stratification lines shown on the logs represent approximate boundaries between soil types and the actual in situ transition may be gradual vertically or discontinuous laterally.

LEAN CLAY

The lean clay is very soft to stiff as indicated by penetration resistance values which ranged from 2 to 13 blows per foot (bpf) and averaged 6 bpf. This material is moderately compressible as indicated by the consolidation tests results shown on Figures 12 through 14. One sample of the material contained no gravel, 3.6 percent sand, and 96.4 percent fines (clay and silt). The lean clay exhibited a liquid limit ranging from 36 to 48 percent and plasticity indices ranging from 16 to 26 percent. The natural moisture contents varied from 20 to 35 percent and averaged 27 percent.

GRAVEL

The gravel encountered was classified as either poorly-graded or well-graded gravel with sand and contained varying amounts of clay. The gravel is very dense as indicated by penetration resistance values which ranged from 70 to greater than 100 bpf and averaged 91 bpf. Samples of the material contained between 51 and 56 percent gravel, between 32 and 42 percent sand, and between 8 and 12 percent fines (clay and silt). The natural moisture contents varied from 5 to 32 percent and averaged 12 percent.

3.3.2 Ground Water

Ground water was not encountered within any of the borings to depths of at least 31.5 feet. Boring B-3 encountered free water in the hole at approximately 2.5 feet below the ground surface; however, the water dissipated once drilling depths reached the porous
gravel layer. It is believed this water is perched and may be associated with recent construction activities or recent precipitation.

The presence or absence of observed ground water may be directly related to the time of the subsurface investigation. Numerous factors contribute to seasonal ground water occurrences and fluctuations, and the evaluation of such factors is beyond the scope of this report.
4.0 ENGINEERING ANALYSIS

4.1 Introduction

The primary geotechnical concern regarding this project is the presence of weak, compressible soils and the anticipated foundation elevation for the proposed construction. The proposed basement places footings approximately eight feet below existing site grade which reduces the amount of clay beneath the structure. The clay is considered the compressible layer and no settlement is anticipated within the underlying gravels; thus, the use of a basement is advantageous in control the settlement potential.

4.2 Site Grading and Excavations

Based on our field work and an assumed finished floor elevation between 4,880 and 4,883 feet, lean clay will be encountered in foundation excavations to the depths anticipated. Based on the borings, ground water should be below the anticipated depths of footing and utility excavations; however, depending on the time of year, occasional pockets of trapped or perched ground water associated with recent precipitation events should be anticipated.

4.3 Conventional Shallow Foundations

Considering the subsurface conditions encountered and the nature of the proposed construction, the structure can be supported on conventional shallow spread footings bearing on at least 18 inches of compacted structural fill overlying properly compacted native lean clay. Based on our experience, the one-dimensional consolidation results, and using an allowable bearing pressure of 2,500 psf, we estimate the total settlement for footings will be less than ¾-inch. Differential settlement within the limits of the structure should be on the order of one-half this magnitude.

The lateral resistance of spread footings is controlled by a combination of sliding resistance between the footing and the foundation material at the base of the footing and the passive earth pressure against the side of the footing in the direction of movement. Design parameters are given in the recommendations section of this report.

If the risk of foundation displacements as summarized above is considered excessive, alternative foundation systems such as helical piers or drilled shafts capable of transferring the foundation loads to the native gravels encountered at depth are warranted. In our opinion, similar foundation systems are not warranted to achieve a suitable level of performance for the structure. However, if similar systems are being considered TD&H Engineering should be consulted to provided additional recommendations for their design.
4.4 Foundation Walls

Foundation walls and other soil retaining structures will be subjected to horizontal loading due to lateral earth pressures. The lateral earth pressures are a function of the natural and backfill soil types and acceptable wall movements, which affect soil strain to mobilize the shear strength of the soil. More soil movement is required to develop greater internal shear strength and lower the lateral pressure on the wall. To fully mobilize strength and reduce lateral pressures, soil strain and allowable wall rotation must be greater for clay soils than for cohesionless, granular soils.

The lowest lateral earth pressure against walls for a given soil type is the active condition and develops when wall movements occur. Passive earth pressures are developed when the wall is forced into the soil, such as at the base of a wall on the side opposite the retained earth side. When no soil strain is allowed by the wall, this is the "at-rest" condition, which creates pressures having magnitudes between the passive and active conditions.

The distribution of the lateral earth pressures on the structure depends on soil type and wall movements or deflections. In most cases, a triangular pressure distribution is satisfactory for design and is usually represented as an equivalent fluid unit weight. Design parameters are given in the recommendations section of this report.

4.5 Floor Slabs and Exterior Flatwork

The natural on-site soils, exclusive of topsoil, are suitable to support lightly to moderately loaded, slab-on-grade construction. A leveling course of granular fill directly beneath the slab is recommended to provide a structural cushion, a capillary-break from the subgrade, and a drainage medium.

4.6 Pavements

A pavement section is a layered system designed to distribute concentrated traffic loads to the subgrade. Performance of the pavement structure is directly related to the physical properties of the subgrade soils and the magnitude and frequency of traffic loadings. Pavement design procedures are based on strength properties of the subgrade and pavement materials, along with the design traffic conditions. Traffic information was not available at the time of this report. We have assumed that weekly traffic for the dining hall will be limited to approximately 3,500 passenger vehicles, 14 medium size delivery trucks and 3 large semi-trailer delivery trucks. A conservative equivalent single axle load (ESAL) of 50,000 ESAL’s over a 20-year design period was used; the minimum allowed by the City of Bozeman Design Standards.
The potential worst case subgrade material is lean clay which is classified as an A-6 (16) soil in accordance with the American Association of State Highway and Transportation Officials (AASHTO) classification. AASHTO considers this soil type to be a poor subgrade due to its limited drainage properties and reduced strength when wetted. Typical California Bearing Ratio (CBR) values for this type of soil range from 2 to 5 percent. It will be necessary to scarify and recompact the subgrade soils prior to placing fill material associated with the pavement section. The fill should be selected, placed, and compacted in accordance with our recommendations.

A geotextile acting as a separator is recommended between the pavement section gravels and the clay subgrade. The geotextile will prevent the upward migration of fines and the loss of aggregate into the subgrade, thereby prolonging the structural integrity and performance of the pavement section.

The pavement section presented in this report is based on an assumed CBR value of 3 percent, assumed traffic loadings, recommended pavement section design information presented in the Asphalt Institute and AASHTO Design Manuals, and our past pavement design experience in Bozeman.

4.7 Utility Corridor

The proposed utility corridor associated with this project is proposed to be a ten foot square precast reinforced concrete tunnel with soil cover ranging from seven to 12 feet. At the anticipated depths lean clay and/or native gravels are anticipated to be encountered in excavations. A structural fill base course is recommended below the precast corridor to provide a uniform base and facilitate precise grading. Settlement potential for the utility corridor is considered low and adverse impacts associated with settlement are not anticipated.
5.0 RECOMMENDATIONS

5.1 Site Grading and Excavations

1. All topsoil and organic material, asphalt, concrete and related construction debris should be removed from the proposed building areas and any areas to receive site grading fill. For planning purposes, a minimum stripping thickness of 6 inches is recommended. Thicker stripping depths may be warranted to remove all detrimental organics as determined once actual stripping operations are performed.

2. All fill and backfill should be non-expansive, free of organics and debris. The on-site soils, exclusive of topsoil, are suitable for use as backfill and general site grading fill on this project. All fill should be placed in uniform lifts not exceeding 8 inches in thickness for fine-grained soils and not exceeding 12 inches for granular soils. All materials compacted using hand compaction methods or small walk-behind units should utilize a maximum lift thickness of 6 inches to ensure adequate compaction throughout the lift. All fill and backfill shall be compacted to the following percentages of the maximum dry density determined by a standard proctor test which is outlined by ASTM D698 or equivalent (e.g. ASTM D4253-D4254).

   a) Below Foundations or Spread Footings ........................................ 98%
   b) Below Slab-on-Grade Construction ........................................... 95%
   c) Foundation Wall Backfill ...................................................... 95%
   d) Below Streets, Parking Lots, or Other Paved Areas .................... 95%
   e) General Landscaping or Nonstructural Areas .............................. 90%

For your consideration, verification of compaction requires laboratory proctor tests to be performed on a representative sample of the soil prior to construction. These tests can require up to one week to complete (depending on laboratory backlog) and this should be considered when coordinating the construction schedule to ensure that delays in construction or additional testing expense is not required due to laboratory processing times or rush processing fees.

3. Imported structural fill should be non-expansive, free of organics and debris, and selected per the following gradation requirements:
<table>
<thead>
<tr>
<th>Screen or Sieve Size</th>
<th>Percent Passing by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-inch</td>
<td>100</td>
</tr>
<tr>
<td>1½-inch</td>
<td>80 – 100</td>
</tr>
<tr>
<td>¾-inch</td>
<td>60 – 100</td>
</tr>
<tr>
<td>No. 4</td>
<td>25 – 60</td>
</tr>
<tr>
<td>No. 200</td>
<td>12 maximum</td>
</tr>
</tbody>
</table>

4. Develop and maintain site grades which will rapidly drain surface and roof runoff away from foundation and subgrade soils; both during and after construction.

5. At a minimum, downspouts from roof drains should discharge at least six feet away from the foundation or beyond the limits of foundation backfill, whichever is greater. All downspout discharge areas should be properly graded away from the structure to promote drainage and prevent ponding.

6. Site utilities should be installed with proper bedding in accordance with pipe manufacturer’s requirements.

7. It is the responsibility of the Contractor to provide safe working conditions in connection with underground excavations. Temporary construction excavations greater than four feet in depth, which workers will enter, will be governed by OSHA guidelines given in 29 CFR, Part 1926. For planning purposes, subsoils encountered in the borings are considered Type B for the lean clay and Type C for the gravel. The soil conditions on site can change due to changes in soils moisture or disturbances to the site prior to construction. Thus, the contractor is responsible to provide an OSHA knowledgeable individual during all excavation activities to regularly assess the soil conditions and ensure that all necessary safety precautions are implemented and followed.

5.2 Conventional Shallow Foundations
The design and construction criteria below should be observed for a spread footing foundation system. The construction details should be considered when preparing the project documents.

8. Both interior and exterior footings should bear on at least 18-inches of compacted structural fill meeting the requirements of Item 3 above and should be designed for a maximum allowable soil bearing pressure of 2,500 psf provided settlements as outlined in the Engineering Analysis are acceptable.
The limits of over-excavation and replacement with compacted structural fill should extend downward and outward laterally from the bottom edges of the footings at a 1:1 (horizontal to vertical) projection. Native soils beneath the structural fill should be compacted per Item 2 above prior to placement of the structural fill.

9. Soils disturbed below the planned depths of footing excavations should be re-compacted or replaced with structural fill per Items 2 and 3 above.

10. Footings shall be sized to satisfy the minimum requirements of the applicable building codes while not exceeding the maximum allowable bearing pressure provided in Item 8 above.

11. Lateral loads are resisted by sliding friction between the footing base and the supporting soil and by lateral pressure against the footings opposing movement. For design purposes, a friction coefficient of 0.45 and a lateral resistance pressure of 100 psf per foot of depth are appropriate for footings bearing properly compacted structural fill and backfill with compacted native lean clay.

12. A representative of the project geotechnical engineer should be retained to observe all footing excavations and backfill phases to verify proper compaction prior to the placement of concrete formwork.

13. If the magnitude of potential foundation displacements, as described in the Engineering Analysis, is not acceptable then alternative deep foundation systems such as helical piers or drilled shafts should be considered. TD&H Engineering is available to provide additional recommendations for the design of these systems upon request.

5.3 Foundation Walls

14. Basement walls which are laterally supported and can be expected to undergo only a slight amount of deflection should be designed for a lateral earth pressure computed on the basis of an equivalent fluid unit weight of 80 pcf for backfill consisting of native lean clay. Alternatively, for backfill consisting of compacted structural fill extending from the footing to within at least three feet of the final grade, a reduced equivalent fluid pressure of 60 pcf may be used for design. Native clay soils should be utilized for backfill within the uppermost three feet unless covered by an impermeable surface (asphalt or concrete).
15. Backfill should be selected, placed, and compacted per Item 2 above. Care should be taken not to over-compact the backfill since this could cause excessive lateral pressure on the walls. Only hand-operated compaction equipment should be used within 5 feet of foundation walls.

16. Exterior footing drains are recommended to remove ground water seepage and infiltrated surface runoff away from foundation soils. This is especially important along basement walls. Drains should consist of a minimum 3-inch diameter, geotextile-wrapped, flexible, slotted pipe (ADS) or perforated, SDR 35, 4-inch diameter, PVC drain tile in poorly-graded gravel with geotextile placed at or below exterior footing grade. Drains shall be covered by at least 12 inches of free-draining, open-graded, granular material. The open-graded granular material should be enveloped in a geotextile to prevent the migration of fines. Use of a single piece of geotextile with a full-width lap at the top is preferred; however, two separate pieces of fabric may be used provided a minimum overlap distance of 12 inches is maintained at all joints. Drains should be sloped to an interior sump or a storm water system. A typical perimeter foundation drain is shown on Construction Standard No. 02801-06C.

Commercially available systems such as Form-A-Drain or NDS EZflow are not considered equal to the system described above. However, based on the subsurface conditions encountered would function adequately to satisfy the intentions of the applicable building codes and are acceptable for use on this site.

17. Foundation walls should be damp-proofed in accordance with Section 1805.2 of the International Building Code (IBC).

5.4 Floor Slabs and Exterior Flatwork

18. For normally loaded, slab-on-grade construction, a minimum 12-inch cushion course consisting of free-draining, crushed gravel should be placed beneath the slabs and compacted to the requirements of Item 2 above. This material should conform to the requirements outlined in Section 02235 of the Montana Public Works Standard Specifications (MPWSS) and incorporate a maximum particle size of ¾-inch. Prior to placing the cushion course, the upper six inches of subgrade should be compacted per Item 2.
19. Concrete floor slabs should be designed using a modulus of vertical subgrade reaction no greater than 150 pci when designed and constructed as recommended above.

20. *Geotechnically*, an underslab vapor barrier is not required for this project. A vapor barrier is normally used to limit the migration of soil gas and moisture into occupied spaces through floor slabs. The need for a vapor barrier should be determined by the architect and/or structural engineer based on interior improvements and/or moisture and gas control requirements.

5.5 Pavements

21. The following pavement sections or an approved equivalent section should be selected in accordance with the discussions in the Engineering Analysis.

### Access Driveways

<table>
<thead>
<tr>
<th>Pavement Component</th>
<th>Component Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphaltic Concrete Pavement</td>
<td>3”</td>
</tr>
<tr>
<td>1 ½-inch Minus Crushed Base Course</td>
<td>15”</td>
</tr>
<tr>
<td>Separation Geotextile Placed Over Compacted Subgrade</td>
<td>Non-woven fabric</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>18”</strong></td>
</tr>
</tbody>
</table>

### Loading Docks

<table>
<thead>
<tr>
<th>Pavement Component</th>
<th>Component Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portland Cement Concrete Pavement</td>
<td>6”</td>
</tr>
<tr>
<td>1 ½-inch Minus Crushed Base Course</td>
<td>12”</td>
</tr>
<tr>
<td>Separation Geotextile Placed Over Compacted Subgrade</td>
<td>Non-woven fabric</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>18”</strong></td>
</tr>
</tbody>
</table>

22. Final asphalt pavement thicknesses exceeding 3 inches shall be constructed in two uniform lifts.
23. Gradations for the crushed base courses shall conform to Section 02235 of the Montana Public Works Standard Specifications (MPWSS).

24. Where the existing grades will be raised more than the thickness of the pavement section, all fill should be placed, compacted and meet the general requirements given in Item 2 above.

25. A geotextile is recommended between the pavement section and the prepared subgrade to prevent the migration of fines upward into the gravel and the loss of aggregate into the subgrade. A Mirafi 600X, Geotex 315ST, or equivalent geotextile is appropriate.

26. The asphaltic cement should be a Performance Graded (PG) binder having a 58-28 grade in accordance with AASHTO MP1.

27. Concrete pavement for loading docks utilizing Portland cement should have a minimum compressive strength of 4,000 psi and a minimum modulus of rupture of 570 psi. A modulus of vertical subgrade reaction no greater than 150 psi is appropriate for design. Reinforcing should extend through all concrete joints to ensure stability of the slab and conformance with design assumptions.

5.6 Utility Corridor

28. A 12-inch base course of structural fill should be selected and placed beneath the tunnel section per Items 2 and 3 above. Walls for the tunnel section should be designed based on an equivalent fluid pressure outlined in Item 13 above. Finally, for the design of the concrete lid, a unit weight of 120 pounds per cubic foot (pcf) is appropriate for backfill materials consisting of native clay.

5.7 Continuing Services

Three additional elements of geotechnical engineering service are important to the successful completion of this project.

29. Consultation between the geotechnical engineer and the design professionals during the design phases is highly recommended. This is important to ensure that the intentions of our recommendations are incorporated into the design, and that any changes in the design concept consider the geotechnical limitations dictated by the on-site subsurface soil and ground water conditions.
30. Observation, monitoring, and testing during construction is required to document the successful completion of all earthwork and foundation phases. A geotechnical engineer from our firm should be retained to observe the excavation, earthwork, and foundation phases of the work to determine that subsurface conditions are compatible with those used in the analysis and design.

31. During site grading, placement of all fill and backfill should be observed and tested to confirm that the specified density has been achieved. We recommend that the Owner maintain control of the Construction Quality Control by retaining the services of an Accredited/Certified Construction Materials Testing Laboratory. We are available to provide construction inspection services as well as materials testing of compacted soils and the placement of Portland cement concrete and asphalt. In the absence of project specific testing frequencies, TD&H recommends the following minimum testing frequencies by used:

**Compaction Testing**

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beneath Column Footings</td>
<td>1 Test per Footing per Lift</td>
</tr>
<tr>
<td>Beneath Wall Footings</td>
<td>1 Test per 25 LF of Wall per Lift</td>
</tr>
<tr>
<td>Beneath Slabs</td>
<td>1 Test per 400 SF per Lift</td>
</tr>
<tr>
<td>Foundation Backfill</td>
<td>1 Test per 50 LF of Wall per Lift</td>
</tr>
<tr>
<td>Access &amp; Loading Dock Driveways</td>
<td>1 Test per 600 SF per Lift</td>
</tr>
</tbody>
</table>

*LF = Lineal Feet  SF = Square Feet*

**Concrete Testing**

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural Concrete†</td>
<td>1 Test per 50 CY per Day</td>
</tr>
<tr>
<td>Non-Structural Concrete</td>
<td>1 Test per Day</td>
</tr>
</tbody>
</table>

† Structural concrete includes all footings, stem walls, slabs, and other load bearing elements

*CY = Cubic Yards*
6.0 SUMMARY OF FIELD AND LABORATORY STUDIES

6.1 Field Explorations

The field exploration program was conducted on March 21st and 22nd of 2016. A total of five borings were drilled to depths ranging from 16.4 to 31.2 feet at the locations shown on Figure 1 to observe subsurface soil and ground water conditions. The borings were advanced through the subsurface soils using a CME-55 truck mounted drill rig equipped with either hollowstem augers or an air rotary casing advancing system. The subsurface exploration and sampling methods used are indicated on the attached boring logs. The borings were logged by Jeremy Miller, EI of TD&H Engineering. The location and elevation of the borings were determined by TD&H surveying personnel.

Samples of the subsurface materials were taken using 1¾-inch I.D. split spoon samplers. The samplers were driven 18 inches, when possible, into the various strata using a 140-pound drop hammer falling 30 inches onto the drill rods. For each sample, the number of blows required to advance the sampler each successive six-inch increment was recorded, and the total number of blows required to advance the sampler the final 12 inches is termed the penetration resistance (“N-value”). This test is known as the Standard Penetration Test (SPT) described by ASTM D1586. When the sampler is driven more than 18 inches, the number of blows required to advance the sampler the second and third six-inch increments are used to determine the N-value. Penetration resistance values indicate the relative density of granular soils and the relative consistency of fine-grained soils. Samples were also obtained by hydraulically pushing a 3-inch I.D., thin-walled Shelby tube sampler into the subsoils. Logs of all soil borings, which include soil descriptions, sample depths, and penetration resistance values, are presented on Figures 2 through 6.

No evidence of ground water was encountered in all but boring B-3. Drilling tools appeared dry, free water was not observed on cuttings or soil samples, and the sound created by dropping rocks into the hole did not indicate the presence of water. In boring B-3, free water was encountered at a depth of 2.5 feet but dissipated once the gravel layer was encountered at 16.5 feet. No water was present in the hole after removing the augers. The depths or elevations of the water levels measured, if encountered, and the date of measurement are shown on the boring logs.

6.2 Laboratory Testing

Samples obtained during the field exploration were returned to our materials laboratory where they were observed and visually classified in general accordance with ASTM D2487, which is based on the Unified Soil Classification System. Representative samples were selected for
testing to determine the engineering and physical properties of the soils in general accordance with ASTM or other approved procedures.

**Tests Conducted:**

<table>
<thead>
<tr>
<th>Test Description</th>
<th>To determine:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Moisture Content</td>
<td>Representative moisture content of soil at the time of sampling.</td>
</tr>
<tr>
<td>Grain-Size Distribution</td>
<td>Particle size distribution of soil constituents describing the percentages of clay/silt, sand and gravel.</td>
</tr>
<tr>
<td>Atterberg Limits</td>
<td>A method of describing the effect of varying water content on the consistency and behavior of fine-grained soils.</td>
</tr>
<tr>
<td>Consolidation</td>
<td>Measurements of the percent compression experienced under various loading conditions. For use in settlement analysis and foundation design.</td>
</tr>
<tr>
<td>UU Shear Strength (Field)</td>
<td>The undrained, unconfined shear strength ($s_u$) of cohesive soils as determined in the field by either a pocket penetrometer or a hand torvane.</td>
</tr>
<tr>
<td>Unconfined Compression</td>
<td>Undrained shear strength properties of cohesive soils determined in the laboratory by axial compression.</td>
</tr>
</tbody>
</table>

The laboratory testing program for this project consisted of 26 moisture-visual analyses, 4 sieve (grain-size distribution) analyses, and 4 Atterberg Limits analyses. The results of the water content analyses are presented on the boring logs, Figures 2 through 6. The grain-size distribution curves and Atterberg limits are presented on Figures 7 through 9. In addition, three consolidation tests and two unconfined compression tests were performed. The consolidation and unconfined compression results are presented on Figures 10 through 14. Unconfined compressive strengths ($q_u$) were determined in the field using a pocket penetrometer. The results are shown on the boring logs at the depths the samples were tested.
7.0 LIMITATIONS

This report has been prepared in accordance with generally accepted geotechnical engineering practices in this area for use by the client for design purposes. The findings, analyses, and recommendations contained in this report reflect our professional opinion regarding potential impacts the subsurface conditions may have on the proposed project and are based on site conditions encountered. Our analysis assumes that the results of the exploratory borings are representative of the subsurface conditions throughout the site, that is, that the subsurface conditions everywhere are not significantly different from those disclosed by the subsurface study. Unanticipated soil conditions are commonly encountered and cannot be fully determined by a limited number of soil borings and laboratory analyses. Such unexpected conditions frequently require that some additional expenditures be made to obtain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs.

The recommendations contained within this report are based on the subsurface conditions observed in the borings and are subject to change pending observation of the actual subsurface conditions encountered during construction. TD&H cannot assume responsibility or liability for the recommendations provided if we are not provided the opportunity to perform limited construction inspection and confirm the engineering assumptions made during our analysis. A representative of TD&H should be retained to observe all construction activities associated with subgrade preparation, foundations, and other geotechnical aspects of the project to ensure the conditions encountered are consistent with our assumptions. Unforeseen conditions or undisclosed changes to the project parameters or site conditions may warrant modification to the project recommendations.

Long delays between the geotechnical investigation and the start of construction increase the potential for changes to the site and subsurface conditions which could impact the applicability of the recommendations provided. If site conditions have changed because of natural causes or construction operations at or adjacent to the site, this report should be reviewed by TD&H to determine the applicability of the conclusions and recommendations provide considering the time lapse or changed conditions.

Misinterpretation of the geotechnical information by other design team members is possible and can result in costly issues during construction and with the final product. We strongly advise that TD&H review those portions of the plans and specifications which pertain to earthwork and foundations to determine if they are consistent with our recommendations and to suggest necessary modifications as warranted. In addition, TD&H should be involved throughout the construction process to observe construction, particularly the placement and compaction of all
fill, preparation of all foundations, and all other geotechnical aspects. Retaining the geotechnical engineer who prepared your geotechnical report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

This report was prepared for the exclusive use of the owner and architect and/or engineer in the design of the subject facility. It should be made available to prospective contractors and/or the contractor for information on factual data only and not as a warranty of subsurface conditions such as those interpreted from the boring logs and presented in discussions of subsurface conditions included in this report.

Prepared by: Jeremy Miller, EI
Geotechnical Engineer

Reviewed by: Craig Nadeau, PE
Geotechnical Manager/Principal
FIGURE 1
MSU DINING HALL
BOZEMAN, MONTANA
BORING LOCATION MAP

REV DATE
KLS
NA
NA
**LOG OF SOIL BORING B-1**

Montana State University
Dining Hall
Bozeman, Montana

Logged by: Jeremy Miller, E.I.
Drilled by: Boland Drilling
Truck-mounted CME-55 with 8’ HSA

March 22, 2016 B16-019

---

**SOIL DESCRIPTION**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Ground Water</th>
<th>SPT Blow Counts</th>
<th>Sample Depth (ft)</th>
<th>PENETRATION RESISTANCE/MOISTURE CONTENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td></td>
<td></td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td></td>
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<td>5</td>
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<td>15.5</td>
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<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
<td></td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

**LEGEND**

- ▲: SPT blows per foot
- ●: Field Moisture content
- ▼: Groundwater Level
- Grab/composite sample
- 1-3/8-inch I.D. split spoon
- 2-1/2-inch I.D. split spoon
- 2-1/2-inch I.D. ring sampler
- 3-inch I.D. thin-walled sampler
- ●: No sample recovery

**Soil Types**
- TOPSOIL: Lean CLAY, appears soft, moist, dark brown, organics
- FILL: Well-Graded GRAVEL with Sand, appears dense, moist, brown, some clay
- Lean CLAY, soft to firm, moist, brown
  \[ q = 2.75 - 3.75 \text{ tsf} \]
- Poorly-Graded GRAVEL with Sand, very dense, moist, gray
- Bottom of Boring

**Note:** The stratification lines represent approximate boundaries between soil types. Actual boundaries may be gradual or transitional.
TOPSOIL: Lean CLAY, appears soft, moist, dark brown, organics
Lean CLAY, very soft to soft, moist, brown

Clayey GRAVEL with Sand, very dense, moist, gray

Qu < 1.0 tsf

LEGEND

- SPT blows per foot
- Field Moisture content
- Groundwater Level
- Grab/composite sample
- 1-3/8-inch I.D. split spoon
- 2-1/2-inch I.D. split spoon
- 2-1/2-inch I.D. ring sampler
- 3-inch I.D. thin-walled sampler
- No sample recovery

Montana State University
Dining Hall
Bozeman, Montana

Logged by: Jeremy Miller, E.I.
Drilled by: Boland Drilling
Truck-mounted CME-55 with 8" HSA &

March 22, 2016 B16-019
SURFACE: Grass
SURFACE ELEVATION: 4,878.2 feet

SOIL DESCRIPTION

Bottom of Boring - Practical Auger Refusal
Ground water not encountered

LEGEND

▲ SPT blows per foot
● Field Moisture content
▼ Groundwater Level
Grab/composite sample
1-3/8-inch I.D. split spoon
2-1/2-inch I.D. split spoon
2-1/2-inch I.D. ring sampler
3-inch I.D. thin-walled sampler
* No sample recovery

Alternate Limits
Plastic Limit
In-Situ Water Content
Liquid Limit
Plasticity Index

Note: The stratification lines represent approximate boundaries between soil types. Actual boundaries may be gradual or transitional.

LOG OF SOIL BORING B-2
Montana State University
Dining Hall
Bozeman, Montana

Logged by: Jeremy Miller, E.I.
Drilled by: Boland Drilling
Truck-mounted CME-55 with 8" HSA &

March 22, 2016 B16-019 Sheet 2 of 2
ASPHALT PAVEMENT
FILL: Well-Graded GRAVEL with Clay and Sand, appears medium dense, moist, brown
Lean CLAY, soft to firm, wet, brown

- Perched water on sampling and drilling equipment at 2.5 feet.

\[ qu = 0.5 - 1.75 \text{ tsf} \]
\[ qu = 1.25 - 1.5 \text{ tsf} \]
\[ qu < 1.0 \text{ tsf} \]

Poorly-Graded GRAVEL with Sand, very dense, moist, dark gray

LEGEND

SPT blows per foot
Field Moisture content
Groundwater Level
Grab/composite sample
1-3/8-inch I.D. split spoon
2-1/2-inch I.D. split spoon
2-1/2-inch I.D. ring sampler
3-inch I.D. thin-walled sampler
No sample recovery

Alinberg Limits
Plastic Limit
In-Situ Water Content
Liquid Limit
Plasticity Index

Notes:
Granular and Nonplastic

Montana State University
Dining Hall
Bozeman, Montana

Logged by: Jeremy Miller, E.I.
Drilled by: Boland Drilling
Truck-mounted CME-55 with 8" HSA

March 22, 2016

B16-019
**LOG OF SOIL BORING B-3**

Montana State University  
Dining Hall  
Bozeman, Montana

Logged by: Jeremy Miller, E.I.  
Drilled by: Boland Drilling  
Truck-mounted CME-55 with 8" HSA

March 22, 2016  
B16-019

**SURFACE:** Asphalt pavement  
**SURFACE ELEVATION:** 4,881.8 feet

**LEGEND**

- ▲ SPT blows per foot  
- ● Field Moisture content  
- ▼ Groundwater Level  
- Grab/composite sample  
- 1-3/8-inch I.D. split spoon  
- 2-1/2-inch I.D. split spoon  
- 2-1/2-inch I.D. ring sampler  
- 3-inch I.D. thin-walled sampler  
- ▼ No sample recovery  
- Altairberg Limits  
- Plastic Limit  
- In-Situ Water Content  
- Liquid Limit  
- Plasticity Index  
- GNP = Granular and Nonplastic  

Note: The stratification lines represent approximate boundaries between soil types. Actual boundaries may be gradual or transitional.

**SOIL DESCRIPTION**

<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>GROUND WATER</th>
</tr>
</thead>
<tbody>
<tr>
<td>20.4</td>
<td>50/5&quot;</td>
</tr>
</tbody>
</table>

Bottom of Boring - No water present at completion of drilling confirming perched water condition

Groundwater not encountered

<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>PENETRATION RESISTANCE/MOISTURE CONTENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>▲ = MOISTURE CONTENT</td>
</tr>
<tr>
<td>10</td>
<td>▼ = BLOWS PER FOOT</td>
</tr>
<tr>
<td>20</td>
<td></td>
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<tr>
<td>22.5</td>
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<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
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<tr>
<td>32.5</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td></td>
</tr>
</tbody>
</table>

**GRAPHIC LOG**

**SURFACE:** Asphalt pavement  
**SURFACE ELEVATION:** 4,881.8 feet

**DEPTH (FT):** 20.4  
**GROUND WATER:** 50/5"  
**SPT BLOW COUNTS:** ▲  
**SAMPLE DEPTH (FT):**

<table>
<thead>
<tr>
<th>Depth (FT)</th>
<th>PENETRATION RESISTANCE/ MOISTURE CONTENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>▲ = MOISTURE CONTENT</td>
</tr>
<tr>
<td>10</td>
<td>▼ = BLOWS PER FOOT</td>
</tr>
<tr>
<td>20</td>
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<tr>
<td>22.5</td>
<td></td>
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<td>25</td>
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<tr>
<td>27.5</td>
<td></td>
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<td>30</td>
<td></td>
</tr>
<tr>
<td>32.5</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Depth (ft)</td>
<td>SPT BLOW COUNTS</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------------</td>
</tr>
<tr>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td>2.5</td>
<td>1-1-2</td>
</tr>
<tr>
<td>5.0</td>
<td>1-2-4-5</td>
</tr>
<tr>
<td>15.2</td>
<td>8-36-37</td>
</tr>
</tbody>
</table>

**Legend**
- ▲ SPT blows per foot
- ● Field Moisture content
- ▼ Groundwater Level
- Grab/composite sample
- 1-3/8-inch I.D. split spoon
- 2-1/2-inch I.D. split spoon
- 2-1/2-inch I.D. ring sampler
- 3-inch I.D. thin-walled sampler
- ○ No sample recovery

**Note:** The stratification lines represent approximate boundaries between soil types. Actual boundaries may be gradual or transitional.
Well-Graded GRAVEL with Clay and Sand, very dense, moist, gray

Ground water not encountered

LEGEND
- SPT blows per foot
- Field Moisture content
- Groundwater Level
- Grab/composite sample
- 1-3/8-inch I.D. split spoon
- 2-1/2-inch I.D. split spoon
- 2-1/2-inch I.D. ring sampler
- 3-inch I.D. thin-walled sampler
- No sample recovery

Note: The stratification lines represent approximate boundaries between soil types. Actual boundaries may be gradual or transitional.
TOPSOIL: Lean CLAY, appears soft, moist, dark brown, organics
Lean CLAY, soft to stiff, moist, dark brown to brown

- qu = 3.5 - 4.0 tsf
- qu = 2.0 - 2.5 tsf
- qu = 1.0 - 1.5 tsf

LEGEND

- SPT blows per foot
- Field Moisture content
- In-Situ Water Content
- Plastic Limit
- Plasticity Index
- Groundwater Level
- Liquid Limit
- Granular and Nonplastic

Note: The stratification lines represent approximate boundaries between soil types. Actual boundaries may be gradual or transitional.
Log of Soil Boring B-5
Montana State University
Dining Hall
Bozeman, Montana

Logged by: Jeremy Miller, E.I.
Drilled by: Boland Drilling
Truck-mounted CME-55 with 8" HSA

March 22, 2016 B16-019

Surface: Grass
Surface Elevation: 4,883.4 feet

Legend:
- SPT blows per foot
- Field Moisture content
- Groundwater Level
- Grab/composite sample
- 1-3/8-inch I.D. split spoon
- 2-1/2-inch I.D. split spoon
- 2-1/2-inch I.D. ring sampler
- 3-inch I.D. thin-walled sampler
- No sample recovery

Note: The stratification lines represent approximate boundaries between soil types. Actual boundaries may be gradual or transitional.

Graphic Log

Soil Description:
- Poorly-Graded GRAVEL with Clay and Sand, very dense, moist, gray
- Bottom of Boring
  - Groundwater not encountered

Penetration Resistance/Moisture Content

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>SPT Blow Counts</th>
<th>Sample Depth (ft)</th>
<th>Groundwater Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.0</td>
<td>13-25-45</td>
<td>25.9</td>
<td>Groundwater not encountered</td>
</tr>
</tbody>
</table>

Graph of Soil Description

Surficial: Grass
Surface Elevation: 4,883.4 feet
Particle Size Distribution Report

<table>
<thead>
<tr>
<th>GRAIN SIZE - mm.</th>
<th>PERCENT FINER</th>
</tr>
</thead>
<tbody>
<tr>
<td>+3&quot;</td>
<td>% GRAVEL</td>
</tr>
<tr>
<td>% SAND</td>
<td>% SILT</td>
</tr>
<tr>
<td>% CLAY</td>
<td>USCS</td>
</tr>
<tr>
<td></td>
<td>LL</td>
</tr>
<tr>
<td></td>
<td>PL</td>
</tr>
<tr>
<td></td>
<td>PI</td>
</tr>
<tr>
<td>○</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>3.6</td>
</tr>
<tr>
<td></td>
<td>96.4</td>
</tr>
<tr>
<td>○</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>55.1</td>
</tr>
<tr>
<td></td>
<td>32.9</td>
</tr>
<tr>
<td></td>
<td>12.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SIEVE size</th>
<th>PERCENT FINER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5&quot;</td>
<td>100.0</td>
</tr>
<tr>
<td>1&quot;</td>
<td>90.1</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>77.5</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>60.5</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>55.9</td>
</tr>
<tr>
<td></td>
<td>#4</td>
</tr>
<tr>
<td></td>
<td>100.0</td>
</tr>
<tr>
<td></td>
<td>44.9</td>
</tr>
<tr>
<td></td>
<td>#10</td>
</tr>
<tr>
<td></td>
<td>34.8</td>
</tr>
<tr>
<td></td>
<td>#20</td>
</tr>
<tr>
<td></td>
<td>27.6</td>
</tr>
<tr>
<td></td>
<td>#40</td>
</tr>
<tr>
<td></td>
<td>22.6</td>
</tr>
<tr>
<td></td>
<td>#60</td>
</tr>
<tr>
<td></td>
<td>19.1</td>
</tr>
<tr>
<td></td>
<td>#80</td>
</tr>
<tr>
<td></td>
<td>17.4</td>
</tr>
<tr>
<td></td>
<td>#100</td>
</tr>
<tr>
<td></td>
<td>16.0</td>
</tr>
<tr>
<td></td>
<td>#200</td>
</tr>
<tr>
<td></td>
<td>96.4</td>
</tr>
<tr>
<td></td>
<td>12.0</td>
</tr>
</tbody>
</table>

| D60              | 12.4738       |
| D30              | 1.1476        |

<table>
<thead>
<tr>
<th>COEFFICIENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cc</td>
</tr>
<tr>
<td>Cu</td>
</tr>
</tbody>
</table>

REMARKS:
○ Report No. A-12815-206
□ Report No. A-12818-206

Location: B-2 Depth: 2.5 - 4.5 ft
Sample Number: A-12815

Location: B-2 Depth: 15.0 - 16.5 ft
Sample Number: A-12818

Client: Mosaic Architecture
Project: Montana State University Dining Hall
Project No.: B16-019
**Particle Size Distribution Report**

- **Material Description**:
  - Well-Graded GRAVEL with Clay and Sand
  - Poorly-Graded GRAVEL with Clay and Sand

- **PERCENT FINER**

<table>
<thead>
<tr>
<th>SIEVE number size</th>
<th>PERCENT FINER</th>
<th>SIEVE number size</th>
<th>PERCENT FINER</th>
</tr>
</thead>
<tbody>
<tr>
<td>○</td>
<td></td>
<td>○</td>
<td></td>
</tr>
<tr>
<td>#4</td>
<td>44.2</td>
<td>#10</td>
<td>33.5</td>
</tr>
<tr>
<td>#10</td>
<td>33.5</td>
<td>#20</td>
<td>27.1</td>
</tr>
<tr>
<td>#20</td>
<td>27.1</td>
<td>#40</td>
<td>22.5</td>
</tr>
<tr>
<td>#40</td>
<td>22.5</td>
<td>#60</td>
<td>17.7</td>
</tr>
<tr>
<td>#60</td>
<td>17.7</td>
<td>#80</td>
<td>14.8</td>
</tr>
<tr>
<td>#80</td>
<td>14.8</td>
<td>#100</td>
<td>12.7</td>
</tr>
<tr>
<td>#100</td>
<td>12.7</td>
<td>#200</td>
<td>8.6</td>
</tr>
<tr>
<td>#200</td>
<td>8.6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **GRAIN SIZE - mm.**

- **SIEVE PERCENT FINER**

<table>
<thead>
<tr>
<th>Inches</th>
<th>Size</th>
<th>Percent Finer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5&quot;</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>1&quot;</td>
<td>92.5</td>
<td>93.0</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>79.6</td>
<td>85.9</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>65.8</td>
<td>74.5</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>58.0</td>
<td>63.7</td>
</tr>
</tbody>
</table>

- **Diameter**

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>D₁₀</td>
<td>0.1052</td>
</tr>
<tr>
<td>D₃₀</td>
<td>1.3101</td>
</tr>
<tr>
<td>D₆₀</td>
<td>10.3003</td>
</tr>
</tbody>
</table>

- **Coefficient**

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cc</td>
<td>1.58</td>
</tr>
<tr>
<td>Cu</td>
<td>97.88</td>
</tr>
</tbody>
</table>

- **Location**

- ○ Location: B-4 Depth: 30.0 - 31.5 ft Sample Number: A-12831
- □ Location: B-5 Depth: 19.0 - 20.5 ft Sample Number: A-12836

- **Remarks**

  - ○ Report No. A-12831-206
  - □ Report No. A-12836-206

- **Client**

  Mosaic Architecture

- **Project**

  Montana State University Dining Hall

- **Project No.**

  B16-019

**TD&H Engineering**

Thomas, Dean & Hoskins, Inc.
Engineering Consultants

**Checked By:** Craig Nadkarni
**LIQUID AND PLASTIC LIMITS TEST REPORT**

![Graph showing liquid and plastic limits with data points]

### MATERIAL DESCRIPTION

<table>
<thead>
<tr>
<th>Project No.</th>
<th>Client</th>
<th>Project</th>
<th>Remarks</th>
</tr>
</thead>
</table>
■ Report No. A-12815-207
▲ Report No. A-12827-207
◆ Report No. A-12833-207 |

<table>
<thead>
<tr>
<th>Location</th>
<th>Depth</th>
<th>Sample Number</th>
<th>Reported Soils</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-1</td>
<td>10.0 - 12.0 ft</td>
<td>A-12813</td>
<td>CL (41, 23, 18)</td>
</tr>
<tr>
<td>B-2</td>
<td>2.5 - 4.5 ft</td>
<td>A-12815</td>
<td>CL (37, 21, 16)</td>
</tr>
<tr>
<td>B-4</td>
<td>7.5 - 9.5 ft</td>
<td>A-12827</td>
<td>CL (48, 21, 16)</td>
</tr>
<tr>
<td>B-5</td>
<td>5.0 - 7.0 ft</td>
<td>A-12833</td>
<td>CL (36, 20, 16)</td>
</tr>
</tbody>
</table>

**Tested By:** MS  
**Checked By:** [Signature]

---

Some text and data points are shown in the image, including LLC, PL, PI, %<#40, %<#200, and USCS values for different samples. The graph illustrates the liquid and plastic limits with various data points for different locations and depths.
UNCONFINED COMPRESSION TEST

Sample No. | 1 |
--- | --- |
Unconfined strength, psf | 3505 |
Undrained shear strength, psf | 1753 |
Failure strain, % | 5.8 |
Strain rate, in./min. | 0.02 |
Water content, % | 24.3 |
Wet density, pcf | 121.5 |
Dry density, pcf | 97.8 |
Saturation, % | 90.5 |
Void ratio | 0.7240 |
Specimen diameter, in. | 2.88 |
Specimen height, in. | 5.59 |
Height/diameter ratio | 1.94 |

Description: Lean CLAY
LL = 48 | PL = 22 | PI = 26 | Assumed GS = 2.7 | Type: Shelby Tube

Project No.: B16-019
Date Sampled: 3-22-2016
Remarks:
Atterberg Limits from adjacent boring at same depth

Figure 10

Client: Mosaic Architecture
Project: Montana State University Dining Hall
Location: B-2
Sample Number: A-12817 | Depth: 7.5 - 9.5 ft

Tested By: CRN
Checked By: Craig MacDonald
**UNCONFINED COMPRESSION TEST**

Sample No. | 1
---|---
Unconfined strength, psf | 6365
Undrained shear strength, psf | 3182
Failure strain, % | 4.9
Strain rate, in./min. | 0.02
Water content, % | 25.4
Wet density,pcf | 123.9
Dry density,pcf | 98.7
Saturation, % | 97.2
Void ratio | 0.7070
Specimen diameter, in. | 2.85
Specimen height, in. | 5.60
Height/diameter ratio | 1.96

**Description:** Lean CLAY  
**LL** = 36  
**PL** = 20  
**PI** = 16  
**Assumed GS** = 2.7  
**Type:** Shelby Tube

**Project No.:** B16-019  
**Date Sampled:** 3-22-16  
**Remarks:**  
Atterberg Limits from sample boring at depth of 5.0 feet

**Client:** Mosaic Architecture  
**Project:** Montana State University  
**Location:** B-5  
**Sample Number:** A-12834  
**Depth:** 10.0 - 12.0 ft

Figure 11

*Tests performed by CRN*  
*Checked by: Craig Madlener*
CONSOLIDATION TEST REPORT

Sat. Moist | Natural | Dry Density (pcf) | LL | PI | Sp. Gr. | Overburden (psf) | Pc (psf) | Cc | Cs | Swell Pressure (psf) | Swell (%) | e₀
--- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | ---
80.8 | 24.0 | 93.3 | 48 | 26 | 2.7 | 980 | ~ 2,500 | 0.123 | 0.021 | ----- | ----- | 0.801

MATERIAL DESCRIPTION

Lean CLAY

USCS | AASHTO
--- | ---
CL | A-7-6

Project No.: B16-019  
Project: MSU Dining Hall  
Location: B-2  
Sample Depth (ft): 7.5 - 9.5

Client: Mosaic Architecture  

Atterberg Limits from adjacent boring at same depth.

TD&H Engineering  
Thomas, Dean & Hoskins, Inc.  
Engineering Consultants

Technician: CRN  
Reviewed By: Craig L. Nelson
CONSOLIDATION TEST REPORT

MATERIAL DESCRIPTION

<table>
<thead>
<tr>
<th>Natural Moist</th>
<th>Dry Density (pcf)</th>
<th>LL</th>
<th>PI</th>
<th>Sp. Gr.</th>
<th>Overburden (psf)</th>
<th>Pc (psf)</th>
<th>Cc</th>
<th>C_s</th>
<th>Swell Pressure (psf)</th>
<th>Swell (%)</th>
<th>e_o</th>
</tr>
</thead>
<tbody>
<tr>
<td>74.3</td>
<td>33.0</td>
<td>76.4</td>
<td>48</td>
<td>26</td>
<td>1110</td>
<td>~ 2,500</td>
<td>0.148</td>
<td>0.012</td>
<td>-----</td>
<td>-----</td>
<td>1.201</td>
</tr>
</tbody>
</table>

Lean CLAY

USCS: CL

AASHTO: A-7-6

Project No.: B16-019
Project: MSU Dining Hall
Bozeman, Montana

Location: B-4
Sample Depth (ft): 10.0 - 12.0

Client: Mosaic Architecture
Atterberg Limits from same boring at depth of 7.5 feet.

Technician: CRN
Reviewed By: Craig L. Madewell

Thomas, Dean & Hoskins, Inc.
Engineering Consultants

Figure 13
CONSOLIDATION TEST REPORT

Natural Sat. Moist (pcf) | Dry Density (pcf) | LL | PI | Sp. Gr. | Overburden (psf) | Pc (psf) | Cc | Cc | Swell Pressure (psf) | Swell (%) | e_o
73.7 | 26.6 | 85.1 | 36 | 16 | 2.7 | 1180 | ~ 2,500 | 0.11 | 0.02 | ----- | ----- | 0.974

MATERIAL DESCRIPTION

Lean CLAY

USCS | CL

AASHTO | A-7-6

Project No. B16-019
Project: MSU Dining Hall
Bozeman, Montana

Location: B-5

Sample Depth (ft): 10.0 - 12.0

Remarks:
Atterberg Limits from same boring at depth of 5.0 feet.

Figure 14

Technician: CRN

Reviewed By: Craig R. Madrian

Thomas, Dean & Hoskins, Inc.
Engineering Consultants
NOTES

1. FOOTING DRAIN PIPE SHALL CONSIST OF A MINIMUM 3-INCH DIAMETER, GEOTEXTILE-WRAPPED, FLEXIBLE, SLOTTED PIPE, ADVANCED DRAINAGE SYSTEM (ADS) WITH DRAIN GUARD OR APPROVED EQUIVALENT.

2. GEOTEXTILE ENVELOPE SHALL INCLUDE A FULL WIDTH OVERLAY AT THE TOP. GEOTEXTILE SHALL BE SOILTEX ST120N, MIRAFI 140NC OR APPROVED EQUIVALENT.

3. DRAINAGE AGGREGATE SHALL BE WASHED OR SCREENED GRAVEL CONFORMING TO THE FOLLOWING GRADATION:

<table>
<thead>
<tr>
<th>SIEVE SIZE</th>
<th>PERCENT PASSING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1/2-INCH</td>
<td>100</td>
</tr>
<tr>
<td>3/4-INCH</td>
<td>75–95</td>
</tr>
<tr>
<td>3/8-INCH</td>
<td>10–20</td>
</tr>
<tr>
<td>NO. 4</td>
<td>0–5</td>
</tr>
</tbody>
</table>

4. FOOTING DRAINS SHALL HAVE A MINIMUM SLOPE OF 0.2 PERCENT TOWARDS A SUMP PUMP OR DAY-LIGHTED A MINIMUM OF 15 FEET AWAY FROM THE FOUNDATION.
STANDARD PENETRATION TEST (ASTM D1586)

<table>
<thead>
<tr>
<th>RELATIVE DENSITY*</th>
<th>Standard Penetration Test (blows/foot)</th>
<th>RELATIVE CONSISTENCY*</th>
<th>Standard Penetration Test (blows/foot)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Granular, Noncohesive (Gravels, Sands, &amp; Silts)</td>
<td>Fine-Grained, Cohesive (Clays)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very Loose</td>
<td>0-4</td>
<td>Very Soft</td>
<td>0-2</td>
</tr>
<tr>
<td>Loose</td>
<td>5-10</td>
<td>Soft</td>
<td>3-4</td>
</tr>
<tr>
<td>Medium Dense</td>
<td>11-30</td>
<td>Firm</td>
<td>5-8</td>
</tr>
<tr>
<td>Dense</td>
<td>31-50</td>
<td>Stiff</td>
<td>9-15</td>
</tr>
<tr>
<td>Very Dense</td>
<td>+50</td>
<td>Very Stiff</td>
<td>15-30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hard</td>
<td>+30</td>
</tr>
</tbody>
</table>

* Based on Sampler-Hammer Ratio of 8.929 E-06 ft/lbf and 4.185 E-05 ft^2/lbf for granular and cohesive soils, respectively (Terzaghi)

PARTICLE SIZE RANGE

<table>
<thead>
<tr>
<th>Sieve Openings (inches)</th>
<th>Standard Sieve Sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>12” 3” 3/4” No.4 No.10 No.40 No.200 &lt;No.200</td>
<td></td>
</tr>
<tr>
<td>BOULDERS COBBLES GRAVELS SANDS SILTS &amp; CLAYS</td>
<td></td>
</tr>
<tr>
<td>Coarse Fine Coarse Medium Fine (Distinguished By Atterberg Limits)</td>
<td></td>
</tr>
</tbody>
</table>

PLASTICITY CHART

For classification of fine-grained soils and the fine-grained fraction of coarse-grained soils.

Equation of "A"-line
Horizontal at PI = 4 to LL = 25.5, then PI = 0.73 (LL-20)

Equation of "U"-line
Vertical at LL = 16 to PI = 7, then PI = 0.9 (LL-8)

GW - Well-graded GRAVEL  SW - Well-graded SAND  CL - Lean CLAY
GP - Poorly-graded GRAVEL SP - Poorly-graded SAND  ML - SILT
GM - Silty GRAVEL SM - Silty SAND  OL - Organic SILT/CLAY
GC - Clayey GRAVEL SC - Clayey SAND  CH - Fat CLAY
MH - Elastic SILT
OH - Organic SILT/CLAY

03/01
Flow Chart For Classifying Coarse-Grained Soils (More Than 50% Retained On The No. 200 Sieve)

- 7'\text{"}+(QJLQHHULQJ
- &RQVXOWDQWV
- Great Falls, Kalispell, Bozeman, MT
- Spokane, WA; Lewiston, ID, Watford City, ND

Flow Chart For Classifying Fine-Grained Soils (50% Or More Passes The No. 200 Sieve)

03/98
SECTION 01 1000
SUMMARY

PART 1 GENERAL - SEE ALSO GCCM GENERAL REQUIREMENTS. IN AREAS WHERE GENERAL REQUIREMENTS CONFLICT WITH THIS SECTION, GCCM GENERAL REQUIREMENTS TAKE PRECEDENCE.

1.01 PROJECT
A. Project Name: Montana State University - New Dining Hall - Shell Bid.
B. Owner's Name: Montana State University: P.O. Box 172760, Bozeman, Montana 59717-2760, (406) 994-5413.
C. Architect's Name: Mosaic Architecture.
D. The project consists of the construction of new dining facility on the campus of Montana State University. This bid package consists of shell package and all related site work.

1.02 CONTRACT DESCRIPTION
A. Contract Type: General Contractor Construction Manager based on a Stipulated Price as described in Document 00 5200 - Agreement Form.

1.03 OWNER OCCUPANCY
A. Owner intends to utilize the project and the project site upon Substantial Completion.
B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations. Coordinate with GCCM (Langlas Construction).
C. Schedule the Work to accommodate Owner occupancy and campus events with GCCM.

1.04 CONTRACTOR USE OF SITE AND PREMISES
A. SEE ALSO GCCM GENERAL REQUIREMENTS. IN AREAS WHERE GENERAL REQUIREMENTS CONFLICT, GCCM GENERAL REQUIREMENTS TAKE PRECEDENCE.
B. Construction Operations: Limited to areas noted on Drawings.
C. Work on this contract is expected to be done during regular business hours Monday through Friday. Any variation from this will require prior approval of Facilities Services.
D. All work must be coordinated with the Owner at all times and Owner must be informed about any work scheduling 48 hours in advance of work being conducted and shall require Owner's approval.
E. General: Limit use of premises to construction activities in areas indicated; allow for Owner occupancy and use by the public. Confine operations to areas within contract limits indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.
F. Contractor shall conduct all of his work in such a manner as to minimize the inconvenience and disruption of Owner's daily schedule.
G. Confine operations at the site to the areas permitted under the contract. Portions of the site beyond the areas on which work is indicated are not to be disturbed. Conform to site rules and regulations affecting the work while engaged in project construction.
H. Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials to the areas designated by the Owner. If additional storage is necessary, obtain and pay for such storage off-site.
I. Contractor shall establish a staging area for storage of materials and equipment.
J. All contractor employees shall abide by Montana State University parking regulations. Temporary parking permits may be purchased from the University Police Office in the Huffman Building at 7th and Kagy.

K. The contractor is to coordinate with Montana State University for the location of the job site trailer office which is at the option of the contractor.

L. Keep driveways and entrances serving the premises clear and available to the Owner and the Owner's employees at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

1.05 SAFETY REQUIREMENTS

A. General: The safety measures required by the Contract Documents are not meant to be inclusive. The Contractor shall be solely responsible for safety on a 24 hour per day, 7 days-per-week basis and shall take whatever additional measures are necessary to ensure the health and safety of the buildings’ occupants, or pedestrians at or near the construction site and access routes and of all other persons in all areas affected by the contractor's activities. Prior to the start of construction, the contractor shall submit to teh Owner, a detailed written plan specifying the safety procedures that will be followed. Include the following: Verbaige, size and location of warning signs, construction sequence as related to dsafety, use of barricades, employee policies as related to safety, and delivery of materials as to related by safety. Revise the safety plan as required during construction and re-submit to teh Owner's representative.

B. All application, material handling, and associated equipment shall conform to and be operated in conformance with OSHA safety requirements.

C. Comply with Federal, State, local and Owner Fire and safety requirements.

D. Advise Owner whatever work is expected to be hazardous or inconvenient (including objectionable odors) to Owner's employees or the building occupants.

E. Construction materials or equipment shall be placed so as not to endanger the work or prevent free access to all emergency devices or utility disconnects.

F. Maintain the proper rated fire extinguishers within easy access wher power tools, sanding or other equipment is being used.

G. The contractor shall erect and maintain, as required by law, conditions and progress of the work, warning signs, barricades and other reasonable safeguards for safety and protection.

H. All personnel shall comply with Montana State University Tobacco Use Policy.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION
SECTON 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1  GENERAL - SEE ALSO GCCM GENERAL REQUIREMENTS. IN AREAS WHERE GENERAL
REQUIREMENTS CONFLICT WITH THIS SECTION, GCCM GENERAL REQUIREMENTS TAKE
PRECEDENCE.

1.01  SECTION INCLUDES
A.  Preconstruction meeting.
B.  Progress meetings.
C.  Construction progress schedule.
D.  Daily construction reports.
E.  Submittals for review, information, and project closeout.
F.  Submittal procedures.

PART 2  PRODUCTS - NOT USED

PART 3  EXECUTION

3.01  PRECONSTRUCTION MEETING
A.  Owner will schedule a meeting after Notice of Award.
B.  Attendance Required:
   1.  Owner
   2.  Mosaic Architecture
   3.  GCCM (GCCM).
   4.  All Major Sub-Contractors.
C.  Agenda:
   1.  Execution of MSU Facilities-GCCM Agreement.
   2.  Submission of executed bonds and insurance certificates.
   4.  Submission of list of Subcontractors, list of Products, schedule of values, and progress
      schedule.
   5.  Designation of personnel representing the parties to Contract and Mosaic Architecture.
   6.  Procedures and processing of field decisions, submittals, substitutions, applications for
      payments, proposal request, Change Orders, and Contract closeout procedures.
   7.  Scheduling.
D.  Langlas & Associates will record minutes and distribute copies within two days after meeting to
    participants, with one copy to North Western Energy, participants, and those affected by
    decisions made.

3.02  PROGRESS MEETINGS
A.  Schedule and administer meetings throughout progress of the Work at weekly intervals, unless
    deemed unnecessary by all in attendance.
B.  Attendance Required:
   1.  GCCM.
   2.  MSU Facilities.
   4.  GCCM's Superintendent.
C.  Agenda:
   1.  Review minutes of previous meetings.
   2.  Review of Work progress.
   3.  Field observations, problems, and decisions.
   4.  Identification of problems that impede, or will impede, planned progress.
   5.  Review of submittals schedule and status of submittals.
6. Maintenance of progress schedule.
7. Corrective measures to regain projected schedules.
8. Planned progress during succeeding work period.
10. Effect of proposed changes on progress schedule and coordination.
11. Other business relating to Work.

D. Langlas & Associates will record minutes and distribute copies within two days after meeting to participants, with two copies to North Western Energy, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE
A. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
B. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.
C. Within 10 days after joint review, submit complete schedule.
D. Submit updated schedule with each Application for Payment.

3.04 SUBMITTALS FOR REVIEW
A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.
   5. LEED submittals and reports.
B. Submit to Mosaic Architecture for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
C. Samples will be reviewed only for aesthetic, color, or finish selection.
D. LEED information.
E. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.05 SUBMITTALS FOR INFORMATION
A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. LEED submittals and reports.
   3. Certificates.
   4. Test reports.
   5. Inspection reports.
   6. Manufacturer's instructions.
   7. Manufacturer's field reports.
   8. Other types indicated.
B. Submit for Mosaic Architecture's knowledge as contract administrator or for MSU Facilities.

3.06 SUBMITTALS FOR PROJECT CLOSEOUT
A. Submit Correction Punch List for Substantial Completion.
B. Submit Final Correction Punch List for Substantial Completion.
C. When the following are specified in individual sections, submit them at project closeout:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
5. Other types as indicated.
D. Submit for MSU Facilities's benefit during and after project completion.

3.07 NUMBER OF COPIES OF SUBMITTALS
A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
B. Documents for Review:
   1. Small Size Sheets, Not Larger Than 8-1/2 x 11 inches: Submit the number of copies that GCCM requires, plus one copy that will be retained by Mosaic Architecture.
C. Samples: Submit the number specified in individual specification sections; one of which will be retained by Mosaic Architecture.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to GCCM unless specifically so stated.

3.08 SUBMITTAL PROCEDURES
A. Shop Drawing Procedures:
   1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related Work.
   2. Generic, non-project specific information submitted as shop drawings do not meet the requirements for shop drawings.
B. Transmit each submittal with a copy of approved submittal form.
C. Transmit each submittal with approved form.
D. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
E. Identify Project, GCCM, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
F. Apply GCCM’s stamp, signed or initialed certifying that review, approval, 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.
G. Schedule submittals to expedite the Project, and coordinate submission of related items.
H. For each submittal for review, allow 15 days excluding delivery time to and from the GCCM.
I. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
J. Provide space for GCCM and Mosaic Architecture review stamps.
K. When revised for resubmission, identify all changes made since previous submission.
L. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
M. Submittals not requested will not be recognized or processed.

END OF SECTION
SECTION 01 3516
LEED SUBMITTAL FORMS

1.01 PURPOSE

A. These forms are for the GCCM's and sub-contractor's use in submitting documentation to be used to determine whether particular credits have been achieved. The cooperation of subcontractors, suppliers, and manufacturers is required. Sub-Contractors to provide completed forms for all items included as part of their work to the GCCM for review and approval.

B. These forms apply to the following LEED Credits:
   1. MR Credits 4.1 and 4.2 - Recycled Content.
   2. MR Credits 5.1 and 5.2 - Regional Materials.
   3. MR Credit 6 - Rapidly Renewable Materials.
   4. MR Credit 7 - Certified Wood.
   5. IEQ Credit 4 - Low-Emitting Materials.

1.02 FORMS

A. 01 3516.01 - LEED Material Cost Summary Form: Certification by GCCM.
B. 01 3516.02 - LEED Wood-Containing Product List: Certification by GCCM.
C. 01 3516.03 - LEED Metal-Containing Product List: Certification by GCCM.
D. 01 3516.04 - LEED New Product Content Form: Including separate reporting of wood, steel, rapidly renewable, and recycled content; data certification by manufacturer of product; cost and quantity certification by GCCM.
E. 01 3516.05 - LEED New Product Source Form: Data certification by manufacturer of product; cost and quantity certification by GCCM.
F. 01 6116.01 - Accessory Material VOC Content Certification Form: Certification by each installer working on project regardless of product type.

1.03 PROCEDURES

A. All LEED submittal forms are to be submitted by GCCM; certifications are to be made by indicated party.

B. Where a LEED Submittal is called for, fill out and submit the appropriate form.
   1. Fill out one form for each different brand name product and each different manufacturer of a lot of commodity products.
   2. Where required attachments are specified, attach the documentation to the back of the form.

C. Each form must be signed by the entity capable of certifying the information.
   1. Certification signatures must be made by an officer of the company.
   2. For products, certification must be made by the manufacturer not the supplier.
   3. For custom fabricated products, certification by the fabricator is acceptable.

D. Submit the completed forms in accordance with the requirements of Section 01 3000 - Administrative Requirements, as information submittals.
   1. Give each form a unique submittal number.
   2. Do not combine LEED forms with product data or shop drawing submittals.

END OF SECTION
01 LEED SUBMITTAL FORM

A. Identification:
   1. Project Name: ______________________________________
   2. Project No.: ________________________________________
   3. Mosaic Architecture: ________________________________

B. This form applies to the following LEED Credits:
   1. MR Credits 4.1 and 4.2 - Recycled Content.
   2. MR Credits 5.1 and 5.2 - Regional Materials.
   3. MR Credit 6 - Rapidly Renewable Materials.
   4. MR Credit 7 - Certified Wood.

C. Procedure:
   1. Because the above listed credits require computations based on the material costs for the
      project, the GCCM is required to submit the following cost breakdown, in addition to any
      cost breakdown specified elsewhere.
   2. Costs are to be material costs excluding labor, overhead, and profit, but including delivery,
      storage, and handling charges. Revise cost summary whenever materials actually
      installed change due to contract modifications or GCCM preference.

02 CERTIFICATION

03 $ _______ TOTAL COST OF ALL MATERIALS

04 $ _______ TOTAL COST OF PLUMBING, HVAC, ELECTRICAL, AND COMMUNICATIONS

05 $ _______ TOTAL COST OF ARCHITECTURAL EQUIPMENT IN DIVISIONS 11 THROUGH

14

06 $ _______ TOTAL COST OF WOOD AND WOOD-BASED MATERIALS, INCLUDING
   TEMPORARY CONSTRUCTION ITEMS THAT WILL NEITHER BE INCORPORATED INTO THE
   WORK NOR RETURNED TO THEIR SUPPLIER FOR RE-USE.

07 CERTIFIED BY: (GCCM)
   A. Print Name: _______________________________________
   B. Signature: _______________________________________
   C. Title: ______________________ (officer of company), Date: ________________

END OF SECTION
.01 LEED SUBMITTAL FORM

A. Identification:
   1. Project Name: __________________________________________
   2. Project No.: ____________________________________________
   3. Mosaic Architecture: ____________________________________

B. This form applies to LEED MR Credit 7 (certified wood).

.02 WOOD-CONTAINING PRODUCTS

A. Wood-containing products are those made of solid wood, wood chip, or wood fiber, or containing components made of solid wood, wood chip, or wood fiber.

B. Rationale: Because the computation for this credit is based on the total material costs for all wood and wood-based products on the project, the GCCM is required to submit the following itemization of wood and wood-based products, including materials used during construction but not incorporated into the finished work.

C. Procedure: For each wood-containing product provided for this project, submit "LEED New Product Content Form". At minimum, submit for the following products. Initial those for which the material content form is attached.

D. Permanent Wood-Containing Product List:
   1. ___ Wood framing, furring, and supports
   2. ___ Sheathing
   3. ___ Blocking, curbing, and nailers
   4. ___ Decking
   5. ___ Siding
   6. ___ Molding and trim
   7. ___ Paneling
   8. ___ Flooring
   9. ___ Architectural woodwork
   10. ___ Cabinets and casework
   11. ___ Stairwork
   12. ___ Doors and frames, including composite construction
   13. ___ Windows
   14. ___ Wood wall covering
   15. ___ Toilet compartments
   16. ___ Wood shelving
   17. ___ Operable partitions

E. Temporary Wood-Containing Product List:
   1. ___ Excavation supports
   2. ___ Concrete formwork and formwork supports
   3. ___ Bracing and shoring
   4. ___ Barricades and enclosures
   5. ___ Field office

.03 CERTIFICATION

A. ___ All other wood-containing products used on this project are shown on the attached list.

B. ___ I certify that there are no other wood-containing products used on this project that exceed 1 percent of total material cost.

C. ___ I certify that there are no other temporary facilities or construction using wood-containing products that exceed 1 percent of the total material cost.

D. CERTIFIED BY: (GCCM)
   1. Print Name: ____________________________________________
2. Signature: ____________________________________________
3. Title: ____________________________________________ (officer of company), Date: ________________

END OF SECTION
LEED METAL-CONTAINING PRODUCT LIST

1.01 LEED SUBMITTAL FORM

A. Identification:
   1. Project Name: ____________________________________________
   2. Project No.: ______________________________________________
   3. Mosaic Architecture: _______________________________________

B. This form applies to LEED Credits MR 4.1 and 4.2 (recycled content).

1.02 STEEL-CONTAINING PRODUCTS

A. Rationale: Although all steel contains reused steel, steel products often cannot be traced to a certain mill lot and, even when they can, the mill's certificate usually does not indicate the proportion of new to reused steel.

B. Procedure: Determine recycled steel content by estimating the proportion of reused steel based on trade association surveys of mill practices multiplied by the quantity of steel by weight in the product.
   2. If the mill source cannot be identified, the product will be considered to have the lowest reused steel content reported in referenced mill practices survey.
   3. For each steel-containing product provided for this project, submit "LEED New Product Content Form". At minimum, submit for the following products. Initial those for which the material content form is attached.

C. Steel-Containing Product List:
   1. ___ Steel piling and permanent shoring.
   2. ___ Concrete reinforcement (bars, mats, wire, mesh), anchor plates.
   3. ___ Structural steel framing members, plates.
   4. ___ Steel structural components of pre-engineered products.
   5. ___ Miscellaneous steel fabrications made from rolled shapes, including equipment supports.
   6. ___ Bar joists and girders.
   7. ___ Steel decking.
   8. ___ Light gage steel framing and trusses.
   9. ___ Steel stairs and ladders.
  10. ___ Steel handrails and railings.
  11. ___ Miscellaneous formed steel fabrications.
  12. ___ Steel wall and roof panels.
  13. ___ Steel sheet metal flashing and trim.
  14. ___ Steel doors and frames.
  15. ___ Non-load-bearing steel framing (studs, ceiling framing, shaftwall)
  16. ___ Suspended ceiling grid.
  17. ___ Steel wall louvers and vents.
  18. ___ Steel access flooring.
  19. ___ Steel flagpoles.

1.03 CERTIFICATION

A. ___ All other steel- and cast iron-containing products used on this project are shown on the attached list.

B. ___ I certify that there are no other steel-containing products used on this project that exceed 1 percent of total material cost less material cost attributed to mechanical and electrical.
C. ___ I certify that there are no other cast iron-containing products used on this project that exceed 1 percent of total material cost less material cost attributed to mechanical and electrical.

D. CERTIFIED BY: (GCCM)
   1. Print Name:___________________________________________________________
   2. Signature:___________________________________________________________
   3. Title: ___________________________ (officer of company), Date: _________________

END OF SECTION
.01 LEED SUBMITTAL FORM

A. Identification:
   1. Project Name: ____________________________________________
   2. Project No.: ____________________________________________
   3. Mosaic Architecture: ______________________________________
   4. Product Name: __________________________________________ (brand name, model number, etc.)
   5. Manufacturer: ___________________________________________ www.________________
      a. Contact: __________________________________________ tel: __________________
   6. Supplier/Sub: ___________________________________________ www.________________
      a. Contact: __________________________________________ tel: __________________
   7. Applicable Specification Section Number(s) ______________________

B. This form applies to LEED Credits MR 4.1 and 4.2 (recycled content), MR 6 (rapidly renewable content), and MR 7 (certified wood).

.02 PRODUCT CERTIFICATION

   1. _____ Product is FSC-trademarked.
   2. _____ FSC Chain-of-Custody certificate number is ________________
   3. FSC: Forest Stewardship Council Chain-of-Custody number or physical trademark; computation of less than 100 percent certified content in accordance with FSC policy.

B. Rapidly Renewable Content: _________ percent by weight.
   1. Description of Rapidly Renewable Content: ________________________________
   2. Definition: Made from plants that are harvested not more than 10 years after planting.

C. Steel Content: _________ percent by weight.
   1. _____ Steel Mill Source is: ________________________________________
   2. _____ Mill letter describing mill process and typical re-used steel content is attached.

D. Other Content: (Percentages by weight may not add up to more than 100 percent.)
   1. Pre-Consumer/Post-Industrial Recycled Content: ________ percent by weight.
   2. Post-Consumer Recycled Content: ________ percent by weight.
   3. Description of Recycled Content: __________________________________________
   4. Definition: Recycled content is defined in accordance with FTC regulations, found in 16 CFR 260.13; see www.ecfr.gov.

E. Total Weight: ___________________ per ____________ (unit).

F. CERTIFIED BY: (Manufacturer)
   1. Print Name: _________________________________________________
   2. Signature: _________________________________________________
   3. Title: _________________________ (officer of company), Date: _________________

.03 COST CERTIFICATION

A. Unit Cost: $ ___________ per _________ (same unit as above); No. of Units Installed: _____

B. OR (enter cost either above or below, not both)

C. Total Installed Material Cost of This Product: $ ______________

D. CERTIFIED BY: (GCCM)
   1. Print Name: _________________________________________________
2. Signature: ______________________________________
3. Title: __________________________________________ (officer of company), Date: _________________

END OF SECTION
LEED SUBMITTAL FORM

A. Identification:
   1. Project Name: _____________________________________________
   2. Project No.: _____________________________________________
   3. Mosaic Architecture: ______________________________________
   4. Product Name: ____________________________________________ (brand name, model number, etc.)
   5. Manufacturer: ____________________________________________
      www.________________________________
      a. Contact: ____________________________________________
         tel:____________________
   6. Supplier/Sub: ____________________________________________
      www.________________________________
      a. Contact: ____________________________________________
         tel:____________________
   7. Applicable Specification Section Number(s) ______________________

B. This form applies to LEED MR Credits 5.1 and 5.2 for new products only; see separate form for reused products.

PRODUCT CERTIFICATION

A. The following percentages of this product were processed in the locations indicated. (Indicate N/A in first column if process is not applicable.)

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Harvest, Extraction, Recovery, or Manufacturing Process</th>
<th>City/County, State, Country</th>
<th>Distance From Project</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Raw Material : __________________________:</td>
<td>__________________________</td>
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<td>%</td>
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<td>Raw Material : __________________________:</td>
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<td>Manufactured at: (primary)</td>
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<td>Manufactured at: (primary)</td>
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<td>Manufactured at: (secondary)</td>
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<td>Manufactured at: (secondary)</td>
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<td>Manufactured at: (final)</td>
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<tr>
<td>%</td>
<td>Manufactured at: (final)</td>
<td>__________________________</td>
<td>_____________________</td>
</tr>
</tbody>
</table>

B. CERTIFIED BY: (Manufacturer)
   1. Print Name: ______________________________________________
   2. Signature: ______________________________________________
   3. Title: __________________________ (officer of company), Date: __________________

COST CERTIFICATION

A. Unit Cost: $___________ per _________ (unit); No. of Units Installed: _____
B. OR (enter cost either above or below, not both)
C. Total Installed Material Cost: $______________
D. CERTIFIED BY: (GCCM)
   1. Print Name: 
   2. Signature: 
   3. Title: _____________________ (officer of company), Date: ________________

END OF SECTION
.01 LEED SUBMITTAL FORM

A. Identification:
   1. Project Name: ______________________________________
   2. Project No.: _______________________________________
   3. Mosaic Architecture: ________________________________
   4. Product Name: ____________________________________(brand name, model number, etc.)
   5. Source Firm: _______________________________________
      www.____________________
a. Contact: __________________________________________
tel: ______________________
   6. Supplier/Sub: ______________________________________
      www.____________________
a. Contact: __________________________________________
tel: ______________________
   7. Applicable Specification Section Number(s) ______________

B. This form applies to LEED MR Credits 3.

.02 PRODUCT CERTIFICATION

A. Product Description: _________________________________
B. Explain source: ____________________________________
C. City/County, State: _________________________________
D. Country: ___________________________________________________________________
E. Distance From Project: ______________________________
F. CERTIFIED BY: (Source Firm)
   1. Print Name: _________________________________________
   2. Signature: __________________________________________
   3. Title: ______________________________________________ (officer of company), Date: ________________

.03 COST CERTIFICATION

A. Unit Cost: $ ___________ per _________ (unit); No. of Units Installed: ______
B. OR (enter cost either above or below, not both)
C. Total Installed Material Cost: $ __________________
D. CERTIFIED BY: (GCCM)
   1. Print Name: _________________________________________
   2. Signature: __________________________________________
   3. Title: ______________________________________________ (officer of company), Date: ________________

END OF SECTION
SECTION 01 3516.07
LEED PROHIBITED CONTENT INSTALLER CERTIFICATION

.01 LEED SUBMITTAL FORM
A. Identification:
   1. Project Name: Montana State University - New Dining Hall - Shell Permit
   2. Project No.: PPA #15-0103
   3. Mosaic Architecture: ABC Architect
B. This form applies to the following LEED credits:
   1. Credit IEQ 4.1; VOC content of field-installed adhesives and sealants.
   2. Credit IEQ 4.4; added-urea-formaldehyde content of composite wood and agrifiber products, defined as particleboard, plywood, medium density fiberboard, wheatboard, strawboard, panel substrates, door cores, and laminating adhesives; applies to manufacturers/suppliers and installers.
C. Procedure:
   1. Because installers are allowed and directed to choose accessory materials suitable for the applicable installation, each installer of work on this project is required to certify that his/their use of these particular materials complies with the contract documents and to provide documentation showing that the products used do not contain the prohibited content.
   2. Volatile organic compounds (VOCs) are defined by the U.S. EPA and state and local regulations applicable to this project. See Contract Documents for minimum criteria.

.02 PRODUCT CERTIFICATION
A. ____ Adhesives: I certify that the installation work of my firm on this project has not required the use of any adhesives.
B. OR (certify either the above or the below, not both)
C. ____ Adhesives: I certify that my firm has NOT installed any adhesive with VOC content exceeding that specified in Section 01 6000 on this project; product data and MSDS sheets for all adhesives used, whether specified or not, are attached.
D. ____ Joint Sealants: I certify that the installation work of my firm on this project has not required the use of any gunnable or pourable joint sealants.
E. OR (certify either the above or the below, not both)
F. ____ Joint Sealants: I certify that my firm has NOT installed any joint sealant with VOC content exceeding that specified in Section 07 9200 on this project; product data and MSDS sheets for all joint sealants used, whether specified or not, are attached.
G. ____ Composite Wood and Agrifiber Products: I certify that the work of my firm on this project has not required the use of any composite wood or agrifiber products, as defined above.
H. OR (certify either the above or the below, not both)
I. ____ Composite Wood and Agrifiber Products: I certify that the composite wood and agrifiber products, as defined above, furnished or installed by my firm DO NOT contain any ADDED urea-formaldehyde binder; product data and MSDS sheets for products used, whether specified or not, are attached.
J. CERTIFIED BY: (Installer/Manufacturer/Supplier Firm)
   1. Firm Name:
   2. Print Name:
   3. Signature:
   4. Title: __________________________ (officer of company), Date:

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
A. References and standards.
B. Control of installation.
C. Tolerances.
D. Testing and inspection agencies and services.
E. Mock-ups.

1.02 REFERENCE STANDARDS

1.03 REFERENCES AND STANDARDS
A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
C. Obtain copies of standards where required by product specification sections.
D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
E. Should specified reference standards conflict with Contract Documents, request clarification from Mosaic Architecture before proceeding.
F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Mosaic Architecture shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.04 TESTING AND INSPECTION AGENCIES AND SERVICES
A. GCCM shall employ and pay for services of an independent testing agency to perform other specified testing.
B. Employment of agency in no way relieves GCCM of obligation to perform Work in accordance with requirements of Contract Documents.
C. GCCM Employed Agency:
2. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED
PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION
A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
B. Comply with manufacturers' instructions, including each step in sequence.
C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Mosaic Architecture before proceeding.
D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
E. Have Work performed by persons qualified to produce required and specified quality.
F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS
A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
B. Notify Architect fifteen (15) working days in advance of dates and times when mock-ups will be constructed.
C. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
D. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
E. Accepted mock-ups shall be a comparison standard for the remaining Work.
F. Where mock-up has been accepted by Mosaic Architecture and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Mosaic Architecture.

3.03 TESTING AND INSPECTION
A. Testing Agency Duties:
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Mosaic Architecture and GCCM of observed irregularities or non-conformance of Work or products.
   5. Perform additional tests and inspections required by Mosaic Architecture.
   6. Submit reports of all tests/inspections specified.
B. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of GCCM.
4. Agency has no authority to stop the Work.

C. GCCM Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers’ facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Mosaic Architecture and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
   5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by GCCM beyond specified requirements.
   6. Arrange with MSU Facilities’s agency and pay for additional samples, tests, and inspections required by GCCM beyond specified requirements.

D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Mosaic Architecture.

E. Re-testing required because of non-conformance to specified requirements shall be paid for by GCCM.

3.04 DEFECT ASSESSMENT
   A. Replace Work or portions of the Work not conforming to specified requirements.
   B. If, in the opinion of Mosaic Architecture, it is not practical to remove and replace the Work, Mosaic Architecture will direct an appropriate remedy or adjust payment.

END OF SECTION
SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Temporary utilities.
B. Temporary telecommunications services.
C. Temporary sanitary facilities.
D. Temporary Controls: Barriers, enclosures, and fencing.
E. Security requirements.
F. Waste removal facilities and services.
G. Project identification sign.
H. Field offices.

1.02 TEMPORARY UTILITIES
A. GCCM will provide the following:
   1. Electrical power and metering, consisting of connection to existing facilities.
   2. Water supply, consisting of connection to existing facilities.

1.03 TELECOMMUNICATION SERVICES
A. GCCM will provide, maintain, and pay for telecommunications services to field office at time of
   project mobilization.
B. Telecommunications services shall include:
   1. Personal computer dedicated to project telecommunications, with necessary software and
      laser printer.

1.04 TEMPORARY SANITARY FACILITIES
A. GCCM will provide and maintain required facilities and enclosures. Provided at time of project
   mobilization.
B. Maintain daily in clean and sanitary condition.

1.05 BARRIERS
A. GCCM will provide barriers to prevent unauthorized entry to construction areas, to prevent
   access to areas that could be hazardous to workers or the public, to allow for owner's use of site
   and to protect existing facilities and adjacent properties from damage from construction
   operations and demolition.
B. GCCM to provide barricades and covered walkways required by governing authorities for public
   rights-of-way and for public access to existing building.
C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.06 FENCING
A. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates
   with locks.

1.07 EXTERIOR ENCLOSURES
A. Provide temporary insulated weather tight closure of exterior openings to accommodate
   acceptable working conditions and protection for Products, to allow for temporary heating and
   maintenance of required ambient temperatures identified in individual specification sections,
   and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware
   and locks.

1.08 FENCING
A. GCCM to provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and
   pedestrian gates with locks.
1.09 SECURITY
   A. GCCM to provide security and facilities to protect Work, existing facilities, and MSU Facilities's operations from unauthorized entry, vandalism, or theft. All sub-contractors to coordinate security needs with GCCM. Each sub-contractor is responsible for securing on site tools and equipment.

1.10 VEHICULAR ACCESS AND PARKING
   A. Coordinate access and haul routes with governing authorities and MSU Facilities.
   B. Provide and maintain access to fire hydrants, free of obstructions.
   C. Provide means of removing mud from vehicle wheels before entering streets.
   D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.11 WASTE REMOVAL
   A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
   B. Provide containers with lids. Remove trash from site periodically.
   C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.
   D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.12 PROJECT IDENTIFICATION
   A. Provide project identification sign of design and construction indicated on Drawings.
   B. Erect on site at location indicated.
   C. No other signs are allowed without MSU Facilities permission except those required by law.

1.13 FIELD OFFICES
   A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack and drawing display table.
   B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.
   C. Locate offices a minimum distance of 30 feet from existing and new structures.

PART 2 PRODUCTS - NOT USED
PART 3 EXECUTION - NOT USED

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prevention of erosion due to construction activities.
B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
C. Restoration of areas eroded due to insufficient preventive measures.
D. Compensation of MSU Facilities for fines levied by authorities having jurisdiction due to non-compliance by GCCM.

1.02 REFERENCE STANDARDS

G. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.
H. USDA TR-55 - Urban Hydrology for Small Watersheds; USDA Natural Resources Conservation Service; 2009.

1.03 PERFORMANCE REQUIREMENTS

A. Comply with all requirements of U.S. Environmental Protection Agency for erosion and sedimentation control, as specified for the National Pollutant Discharge Elimination System (NPDES), Phases I and II, under requirements for the 2003 Construction General Permit (CGP), whether the project is required by law to comply or not.
B. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.
C. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
D. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
E. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
   1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
   2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.
F. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
   1. Control movement of sediment and soil from temporary stockpiles of soil.
2. Prevent development of ruts due to equipment and vehicular traffic.
3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to MSU Facilities.

G. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
   1. Prevent windblown soil from leaving the project site.
   2. Prevent tracking of mud onto public roads outside site.
   3. Prevent mud and sediment from flowing onto sidewalks and pavements.
   4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to MSU Facilities.

H. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to MSU Facilities; remove deposited sediments; comply with requirements of authorities having jurisdiction.
   2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

I. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to MSU Facilities; remove deposited sediments; comply with requirements of authorities having jurisdiction.

J. Open Water: Prevent standing water that could become stagnant.

K. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. LEED Submittals: Submit all submittals required in this section in accordance with procedures specified in Section 01 3515.

C. Erosion and Sedimentation Control Plan:
   1. Submit within 2 weeks after Notice to Proceed.
   2. Include:
      a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
      b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
      c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
      d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
      e. Other information required by law.
      f. Format required by law is acceptable, provided any additional information specified is also included.
   3. Obtain the approval of the Plan by authorities having jurisdiction.
   4. Obtain the approval of the Plan by MSU Facilities.

D. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.

E. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.
PART 2 PRODUCTS

2.01 MATERIALS

A. Mulch: Use one of the following:
   1. Straw or hay.
   2. Wood waste, chips, or bark.
   3. Erosion control matting or netting.

B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

C. Bales: Air dry, rectangular straw bales.
   1. Cross Section: 14 by 18 inches, minimum.
   2. Bindings: Wire or string, around long dimension.

D. Bale Stakes: One of the following, minimum 3 feet long:
   1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
   2. Wood, 2 by 2 inches in cross section.

E. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
   1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D4751.
   2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D4491.
   3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
   4. Tensile Strength: 100 lb-f, minimum, in cross-machine direction; 124 lb-f, minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
   5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632/D4632M.
   6. Tear Strength: 55 lb-f, minimum, when tested in accordance with ASTM D4533.
   7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.
   8. Manufacturers:
      c. Propex Geosynthetics: www.geotextile.com

F. Silt Fence Posts: One of the following, minimum 5 feet long:
   1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
   2. Softwood, 4 by 4 inches in cross section.
   3. Hardwood, 2 by 2 inches in cross section.

G. Gravel: See Section 32 1123 for aggregate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

B. Construction Entrances: Traffic-bearing aggregate surface.
   1. Width: As required; 20 feet, minimum.
   2. Length: 50 feet, minimum.
3. Provide at each construction entrance from public right-of-way.
4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.

C. Linear Sediment Barriers: Made of silt fences.
   1. Provide linear sediment barriers:
      a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
   2. Space sediment barriers with the following maximum slope length upslope from barrier:
      a. Slope of Less Than 2 Percent: 100 feet.
      b. Slope Between 2 and 5 Percent: 75 feet.
      c. Slope Between 5 and 10 Percent: 50 feet.
      d. Slope Between 10 and 20 Percent: 25 feet.
      e. Slope Over 20 Percent: 15 feet.

D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
   1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
   2. Straw bale row blocking entire inlet face area; anchor into pavement.

E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.

F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.

G. Soil Stockpiles: Protect using one of the following measures:
   1. Cover with polyethylene film, secured by placing soil on outer edges.
   2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.

H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
   1. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.

I. Temporary Seeding: Use where temporary vegetated cover is required.

3.04 INSTALLATION

A. Traffic-Bearing Aggregate Surface:
   1. Excavate minimum of 6 inches.
   2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
   3. Place and compact at least 6 inches of 1.5 to 3.5 inch diameter stone.

B. Silt Fences:
   1. Store and handle fabric in accordance with ASTM D4873.
   2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
   3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
   4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
   5. Install with top of fabric at nominal height and embedment as specified.
   6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
   7. Fasten fabric to wood posts using one of the following:
      a. Four nails per post with 3/4 inch diameter flat or button head, 1 inch long, and 14 gage, 0.083 inch Shank diameter.
b. Five staples per post with at least 17 gage, 0.0453 inch wire, 3/4 inch crown width and 1/2 inch long legs.

9. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.

C. Straw Bale Rows:
1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
2. Install bales so that bindings are not in contact with the ground.
3. Embed bales at least 4 inches in the ground.
4. Anchor bales with at least two stakes per bale, driven at least 18 inches into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
5. Fill gaps between ends of bales with loose straw wedged tightly.
6. Place soil excavated for trench against bales on the upslope side of the row, compacted.

D. Temporary Seeding:
1. When hydraulic seeder is used, seedbed preparation is not required.
2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.
4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
5. Incorporate fertilizer into soil before seeding.
6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep.
7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
8. Repeat irrigation as required until grass is established.

3.05 MAINTENANCE
A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
B. Repair deficiencies immediately.

C. Silt Fences:
1. Promptly replace fabric that deteriorates unless need for fence has passed.
2. Remove silt deposits that exceed one-third of the height of the fence.
3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

D. Straw Bale Rows:
1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
2. Remove silt deposits that exceed one-half of the height of the bales.
3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

E. Clean out temporary sediment control structures weekly and relocate soil on site.
F. Place sediment in appropriate locations on site; do not remove from site.

3.06 CLEAN UP
A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Mosaic Architecture.
B. Clean out temporary sediment control structures that are to remain as permanent measures.
C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION
SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.
B. Sustainable design-related product requirements.
C. Transportation, handling, storage and protection.
D. Product option requirements.
E. Substitution limitations and procedures.
F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 3515 - LEED Certification Procedures: Requirements for LEED reports.
B. Section 01 4000 - Quality Requirements: Product quality monitoring.
C. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
D. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting packaging and substitutions.

1.03 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind and from a single source.
B. Compatibility of Options: When the contractor is given the option of selecting between two or more products for use on the project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.
C. Nameplates: except for the required labels and operating data, do not attach or imprint manufacturer's or producers nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.
1. Labels: Locate required product labels and stamps on concealed surface or where required for observation after installation, on an accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service connected or power operated equipment. Locate on an easily accessible surface which is inconspicuous in occupied space The nameplates shall contain, as applicable, the following information and other essential operating data:
   a. Name of product and manufacturer
   b. Model and serial number
   c. Capacity
   d. Speed
   e. Rating
D. Greensence GS-36: Commercial Adhesives; Green Seal, Inc; 2009.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Should space on site be inadequate for storage of equipment and materials to be incorporated in the work, the contractor and all sub-contractors will be required to provide off-site storage for such materials and equipment.
   1. Locations and facilities for off-site storage shall be identified for the Owner and Architect.
   2. Off-Site storage shall be governed by the requirements of Article 9.3.2 of the General Conditions.
B. Deliver, store and handle products in accordance with the manufacturers recommendations, using means and methods that will prevent damage, deterioration and loss, including theft.
1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.
3. Deliver products to the site in the manufacturers original sealed container and other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
4. Inspect products upon delivery to ensure compliance with the construction documents and to ensure that products are undamaged and properly protected.
5. Store products in a manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store heavy materials away from the project structure in a manner that will not endanger the supporting construction.
7. Store products subject to damage by the elements above ground, under cover in a weather tight enclosure with ventilation adequate to prevent condensation.

1.05 SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. Submit within 15 days after date of Notice to Proceed.
   2. For products specified only by reference standards, list applicable reference standards.
B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.
E. LEED Submittals: Use forms provided in Section 01 3516.

PART 2 PRODUCTS

2.01 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.
B. Where all other criteria are met, GCCM shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 6116.
   2. If wet-applied, have lower VOC content, as defined in Section 01 6116.
   3. Are extracted, harvested, and/or manufactured closer to the location of the project.
   4. Have longer documented life span under normal use.
   5. Result in less construction waste.
   6. Are made of vegetable materials that are rapidly renewable.
   7. Have a published GreenScreen Chemical Hazard Analysis.
C. Regionally-Sourced Products:
   1. Overall Project Requirement: Provide materials amounting to a minimum of 10 percent of the total value of all materials (excluding plumbing, HVAC, electrical, elevators, and other equipment) that have been extracted, harvested, or recovered, as well as manufactured, within a radius of 500 miles from the project site.
      a. This provision is applicable to LEED Credit MR 5.1; show quantity on LEED report.
      b. This provision is applicable to LEED Credit MR 5.2; show quantity on LEED report.
   2. Specific Product Categories: Provide regionally-sourced products as specified elsewhere.
3. LEED Submittals: Indicate location of manufacture; in all cases indicate location of final assembly; for harvested products, indicate location of harvest; for extracted (i.e. mined) products, indicate location of extraction; for products involving multiple manufacturing steps, indicate all locations of manufacture or assembly; provide manufacturer or supplier certification of location information.

D. Products with Rapidly Renewable Material Content:
1. Definition: Materials made from plants that are typically harvested within 10 years or less after planting.
2. Overall Project Requirement: Provide materials amounting to a minimum of 2.5 percent of the total value of all materials and products used on the project.
3. Specific Product Categories: Provide renewable material content as specified elsewhere.
4. Calculations: Where information about renewable material content is required to be submitted and an item is not made completely of rapidly renewable material, calculate content by dividing the renewable material content by weight by the total weight of the item.
5. LEED Submittals: State unit cost, renewable material content percentage, quantity installed, total material cost, and total renewable material value; attach evidence of contents from either manufacturer or an independent agency.

E. Products with Recycled Content:
1. Overall Project Requirement: Provide products with recycled content such that the sum of post-consumer recycled content plus one-half of the post-industrial recycled content constitutes at least 10 percent of the total value of all products installed, except mechanical and electrical components.
   a. This provision is applicable to LEED Credit MR 4; show quantity and calculations on LEED report.
2. Specific Product Categories: Provide recycled content as specified elsewhere.
3. Calculations: Where information about recycled content is required to be submitted:
   a. Determine percentage of post-consumer and post-industrial content separately, using the guidelines contained in 16 CFR 260.7(e).
   b. Previously used, reused, refurbished, and salvaged products are not considered recycled.
   c. Wood fabricated from timber abandoned in transit to original mill is considered reused, not recycled.
   d. Determine percentage of recycled content of any item by dividing the weight of recycled content in the item by the total weight of all material in the item.
   e. Determine value of recycled content of each item separately, by multiplying the content percentage by the value of the item.
4. LEED Submittals: State unit cost, post-consumer and post-industrial content percentages, quantity installed, total material cost, and total recycled content value; attach evidence of contents from either manufacturer or an independent agency.

F. Sustainably Harvested Wood:
1. Definition: Wood-based materials include but are not limited to structural framing, dimension lumber, flooring, wood doors, finishes, and furnishings that are permanently installed in the project. Wood and wood-based products not permanently installed in the project are not included in the definition.
2. Overall Project Requirement: Provide a minimum of 50 percent of all wood-based materials made of sustainably harvested wood.
   a. This provision is applicable to LEED Credit MR 6/7; show quantity on LEED report and submit certificates.
3. Specific Wood-Based Fabrications: Fabricate of sustainably harvested wood when so specified elsewhere.
4. Certification: Provide wood certified or labeled by an organization accredited by one of the following:
5. LEED Submittals: State unit cost of each wood-based item, quantity installed, quantity certified as sustainably harvested, total wood-based material cost, and total sustainably harvested value; provide letter of certification signed by supplier of each item, indicating compliance with the specified requirements and identifying the certifying organization.
   a. Include the certifying organization's certification numbers for each certified product, itemized on a line-item basis.
   b. Attach copies of invoices bearing the certifying organization's certification numbers.

2.02 PRODUCT OPTIONS
   A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
   B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
   C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.03 MAINTENANCE MATERIALS
   A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
   B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES
   A. Bid Description specifies time restrictions for submitting requests for substitutions during the bidding period and the documents required. Comply with requirements specified in Section 00 2113.
   B. Substitutions may be considered when a product becomes unavailable through no fault of the GCCM.
   C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
   D. A request for substitution constitutes a representation that the submitter:
      1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
      2. Agrees to provide the same warranty for the substitution as for the specified product.
      3. Agrees to coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to MSU Facilities.
      4. Waives claims for additional costs or time extension that may subsequently become apparent.
   E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

3.02 TRANSPORTATION AND HANDLING
   A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
   B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
   C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
   D. Transport and handle products in accordance with manufacturer's instructions.
   E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

G. Comply with manufacturer's warranty conditions, if any.

H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

I. Prevent contact with material that may cause corrosion, discoloration, or staining.

J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION
SECTION 01 6116
VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Requirement for installer certification that they did not use any non-compliant products.
B. VOC restrictions for product categories listed below under "DEFINITIONS."
C. All products of each category that are installed in the project must comply; MSU Facilities's project goals do not allow for partial compliance.

1.02 RELATED REQUIREMENTS
A. Section 01 3000 - Administrative Requirements: Submittal procedures.

1.03 DEFINITIONS
A. VOC-Restricted Products: All products of each of the following categories when installed or applied on-site in the building interior:
   1. Adhesives, sealants, and sealer coatings.
   2. Carpet.
   3. Carpet tile.
   4. Resilient floor coverings.
   5. Wood flooring.
   6. Paints and coatings.
   7. Insulation.
   8. Gypsum board.
   10. Cabinet work.
   11. Wall coverings.
   12. Composite wood and agrifiber products used either alone or as part of another product.
B. Interior of Building: Anywhere inside the exterior weather barrier.
C. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
D. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

1.04 REFERENCE STANDARDS
A. CAL (CHPS LEM) - Low-Emitting Materials Product List; California Collaborative for High Performance Schools (CHPS); current edition at www.chps.net/.
D. GEI (SCH) - GREENGUARD "Children and Schools" Certified Products; GREENGUARD Environmental Institute; current listings at www.greenguard.org.
E. GreenSeal GC-03 - Anti-Corrosive Paints; Green Seal, Inc.; 2007
F. GreenSeal GS-11 - Paints; Green Seal, Inc.; 1993.
H. SCAQMD 1113 - South Coast Air Quality Management District Rule No.1113; current edition.
I. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.
J. SCS (CPD) - SCS Certified Products; current listings at www.scscertified.com.
1.05 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Evidence of Compliance: Submit for each different product in each applicable category.
   C. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.
   D. Installer Certifications Regarding Prohibited Content: Require each installer of any type of product (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of his products, or 2) that such products used comply with these requirements.

1.06 QUALITY ASSURANCE
   A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MATERIALS
   A. All VOC-Restricted Products: Provide products having VOC content of types and volume not greater than those specified in State of California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers.
      1. Evidence of Compliance: Acceptable types of evidence are:
         f. Current certification by any other agencies acceptable to CHPS.
         g. Report of laboratory testing performed in accordance with CHPS requirements for getting a product listed in the Low-Emitting Materials Product List; report must include laboratory's statement that the product meets the specified criteria.
      2. Product data submittals showing VOC content are NOT acceptable forms of evidence.
   B. Adhesives and Joint Sealants: Provide only products having volatile organic compound (VOC) content not greater than required by South Coast Air Quality Management District Rule No.1168.
      1. Evidence of Compliance: Acceptable types of evidence are:
         a. Report of laboratory testing performed in accordance with requirements.
   C. Aerosol Adhesives: Provide only products having volatile organic compound (VOC) content not greater than required by GreenSeal GS-36.
      1. Evidence of Compliance: Acceptable types of evidence are:
         a. Current GreenSeal Certification.
   D. Paints and Coatings:
      1. Provide coatings that comply with the most stringent requirements specified in the following:
         b. USGBC LEED Rating System, edition as stated in Section 01 3515; for interior wall and ceiling finish (all coats), anti-corrosive paints on interior ferrous metal, clear wood stains and finishes, sanding sealers, other sealers, shellac, and floor coatings.
            1) Architectural Paints and Coatings: Do not exceed VOC content limits established in GreenSeal GS-11.
2) Anti-Corrosive and Anti-Rust Paints: Do not exceed VOC content limits established in GreenSeal GC-03.
3) Clear Wood Finishes, Floor Coatings, Stains, Primers and Shellacs: Do not exceed the VOC content limits established in SCAQMD Rule No. 1113.

2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

3. Evidence of Compliance: Acceptable types of evidence are:
   a. Report of laboratory testing performed in accordance with requirements.

E. Carpet and Adhesive: Provide products having VOC content not greater than that required for CRI Green Label Plus certification.
   1. Evidence of Compliance: Acceptable types of evidence are:
      b. Report of laboratory testing performed in accordance with requirements.

F. Carpet Tile and Adhesive: Provide products having VOC content not greater than that required for CRI Green Label Plus certification.
   1. Evidence of Compliance: Acceptable types of evidence are:
      b. Report of laboratory testing performed in accordance with requirements.

G. Carpet Tile and Adhesive: Provide products having VOC content as specified in Section 09 6813.

   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Published product data showing compliance with requirements.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. MSU Facilities reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to MSU Facilities.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by GCCM.

END OF SECTION
SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL - SEE ALSO GCCM GENERAL REQUIREMENTS. IN AREAS WHERE GENERAL REQUIREMENTS CONFLICT WITH THIS SECTION, GCCM GENERAL REQUIREMENTS TAKE PRECEDENCE.

1.01 SECTION INCLUDES
A. Examination, preparation, and general installation procedures.
B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
C. Cutting and patching.
D. Surveying for laying out the work.
E. Cleaning and protection.
F. Starting of systems and equipment.
G. Demonstration and instruction of MSU Facilities personnel.
H. Closeout procedures, including GCCM’s Correction Punch List, except payment procedures.

1.02 RELATED REQUIREMENTS
A. Section 01 3000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.
B. Section 01 4000 - Quality Requirements: Testing and inspection procedures.
C. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.
D. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

1.03 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
   3. Submit surveys and survey logs for the project record.
C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   5. Work of MSU Facilities or separate Contractor.
D. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.04 QUALIFICATIONS
A. For survey work, employ a land surveyor registered in Montana and acceptable to Mosaic Architecture. Submit evidence of Surveyor’s Errors and Omissions insurance coverage in the form of an Insurance Certificate.

1.05 PROJECT CONDITIONS
A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

D. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.
   2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
   3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
   4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

F. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

G. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

H. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.06 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F.Coordinate completion and clean-up of work of separate sections.

G. After MSU Facilities occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of MSU Facilities's activities.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.
D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Mosaic Architecture of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Mosaic Architecture the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Mosaic Architecture.

F. Utilize recognized engineering survey practices.

G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations; and ________.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

H. Periodically verify layouts by same means.

I. Maintain a complete and accurate log of control and survey work as it progresses.

3.04 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer’s instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as shown.
   2. Report discrepancies to Mosaic Architecture before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.
B. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. Provide temporary connections as required to maintain existing systems in service.
   4. Verify that abandoned services serve only abandoned facilities.

3.06 PROGRESS CLEANING
A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.07 PROTECTION OF INSTALLED WORK
A. Protect installed work from damage by construction operations.
B. Provide special protection where specified in individual specification sections.
C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
G. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.08 SYSTEM STARTUP
A. Coordinate schedule for start-up of various equipment and systems.
B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
D. Verify that wiring and support components for equipment are complete and tested.
E. Execute start-up under supervision of applicable GCCM personnel and manufacturer's representative in accordance with manufacturers' instructions.
F. Submit a written report that equipment or system has been properly installed and is functioning correctly.
3.09 DEMONSTRATION AND INSTRUCTION
   A. See Section 01 7900 - Demonstration and Training.
   B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
   C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
   D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.
   E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

3.10 ADJUSTING
   A. Adjust operating products and equipment to ensure smooth and unhindered operation.
   B. Testing, adjusting, and balancing HVAC systems: See Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

3.11 FINAL CLEANING
   A. Use cleaning materials that are nonhazardous.
   B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
   C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
   D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
   E. Clean filters of operating equipment.
   F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems, and ______.
   G. Clean site; sweep paved areas, rake clean landscaped surfaces.
   H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.12 CLOSEOUT PROCEDURES
   A. Make submittals that are required by governing or other authorities.
      1. Provide copies to Mosaic Architecture.
   B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the GCCM's Correction Punch List for GCCM's Notice of Substantial Completion.
   C. Notify Mosaic Architecture when work is considered ready for Mosaic Architecture's Substantial Completion inspection.
   D. Submit written certification containing GCCM's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Mosaic Architecture's Substantial Completion inspection.
   E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Mosaic Architecture's and GCCM's comprehensive list of items identified to be completed or corrected and submit to Mosaic Architecture.
   F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to MSU Facilities-occupied areas.
   G. Notify Mosaic Architecture when work is considered finally complete and ready for Mosaic Architecture's Substantial Completion final inspection.
H. Complete items of work determined by Mosaic Architecture listed in executed Certificate of Substantial Completion.

END OF SECTION
SECTION 01 7419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. MSU Facilities requires that this project generate the least amount of trash and waste possible.
B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
   1. Aluminum and plastic beverage containers.
   2. Corrugated cardboard.
   3. Wood pallets.
   4. Clean dimensional wood: May be used as blocking or furring.
   5. Land clearing debris, including brush, branches, logs, and stumps; see Section 31 1000 - Site Clearing for use options.
   6. Concrete: May be crushed and used as riprap, aggregate, sub-base material, or fill.
   7. Bricks: May be used on project if whole, or crushed and used as landscape cover, sub-base material, or fill.
   8. Asphalt paving: May be recycled into paving for project.
   9. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
   10. Glass.
   11. Gypsum drywall and plaster.
   13. Carpet, carpet cushion, carpet tile, and carpet remnants, both new and removed: DuPont (http://flooring.dupont.com) and Interface (www.interfaceinc.com) conduct reclamation programs.
   15. Plastic sheeting.
   16. Rigid foam insulation.
E. LEED Certification for this project is dependent on diversion of 75 percent, by weight, of potential landfill trash/waste by recycling and/or salvage.
F. GCCM shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
G. GCCM shall develop and follow a Waste Management Plan designed to implement these requirements.
H. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.
I. Regulatory Requirements: GCCM is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.
1.02 RELATED REQUIREMENTS
A. Section 01 3000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
B. Section 01 5000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
C. Section 01 6000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.
D. Section 01 7000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.
E. Section 31 1000 - Site Clearing: Handling and disposal of land clearing debris.

1.03 DEFINITIONS
A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
I. Return: To give back reusable items or unused products to vendors for credit.
J. Reuse: To reuse a construction waste material in some manner on the project site.
K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
C. Landfill Alternatives Proposal: Within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner, submit a projection of trash/waste that will require disposal and alternatives to landfilling, with net costs.
   1. Submit to Mosaic Architecture for MSU Facilities's review and approval.
   2. If MSU Facilities wishes to implement any cost alternatives, the Contract Price will be adjusted as specified elsewhere.
   3. Include an analysis of trash/waste to be generated and landfill options as specified for Waste Management Plan described below.
   4. Describe as many alternatives to landfilling as possible:
      a. List each material proposed to be salvaged, reused, or recycled.
      b. List the proposed local market for each material.
      c. State the estimated net cost resulting from each alternative, after subtracting revenue from sale of recycled or salvaged materials and landfill tipping fees saved due to diversion of materials from the landfill.

D. Waste Management Plan: Include the following information:
   1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
   2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
   3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
   4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
   5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
   6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

E. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
   1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
   2. Submit Report on a form acceptable to MSU Facilities.
   3. Landfill Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
      c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   4. Incinerator Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
      c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   5. Recycled and Salvaged Materials: Include the following information for each:
a. Identification of material, including those retrieved by installer for use on other projects.
b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.

6. Material Reused on Project: Include the following information for each:
   a. Identification of material and how it was used in the project.
   b. Amount, in tons or cubic yards.
   c. Include weight tickets as evidence of quantity.

7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 - NOT USED

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

A. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
B. See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.
C. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.
D. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, MSU Facilities, and Mosaic Architecture.
C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Pre-bid meeting.
   2. Pre-construction meeting.
   3. Regular job-site meetings.
E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials.
materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION
SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL - SEE ALSO GCCM GENERAL REQUIREMENTS. IN AREAS WHERE GENERAL REQUIREMENTS CONFLICT WITH THIS SECTION, GCCM GENERAL REQUIREMENTS TAKE PRECEDENCE.

1.01 SECTION INCLUDES
A. Project Record Documents.
B. Operation and Maintenance Data.
C. Warranties and bonds.

1.02 RELATED REQUIREMENTS
A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.
C. Individual Product Sections: Specific requirements for operation and maintenance data.
D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS
A. Project Record Documents: Submit documents to Mosaic Architecture with claim for final Application for Payment.
B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Mosaic Architecture will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by MSU Facilities, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Mosaic Architecture comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 10 days after final inspection.
C. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with MSU Facilities's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS
A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Addenda.
   3. Change Orders and other modifications to the Contract.
B. Ensure entries are complete and accurate, enabling future reference by MSU Facilities.
C. Store record documents separate from documents used for construction.
D. Record information concurrent with construction progress.
3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.


D. Additional information as specified in individual product specification sections.

E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

F. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

E. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

F. Provide servicing and lubrication schedule, and list of lubricants required.

G. Include manufacturer's printed operation and maintenance instructions.
H. Include sequence of operation by controls manufacturer.
I. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
J. Provide control diagrams by controls manufacturer as installed.
K. Provide GCCM's coordination drawings, with color coded piping diagrams as installed.
L. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
M. Include test and balancing reports.
N. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS
A. Assemble operation and maintenance data into durable manuals for MSU Facilities's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
C. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
D. Prepare data in the form of an instructional manual.
E. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
F. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
G. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Mosaic Architecture, Consultants, GCCM and subcontractors, with names of responsible parties.
H. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
I. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
J. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
K. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
L. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.
M. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Mosaic Architecture, GCCM, Subcontractors, and major equipment suppliers.
   2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
      a. Significant design criteria.
      b. List of equipment.
      c. Parts list for each component.
      d. Operating instructions.
      e. Maintenance instructions for equipment and systems.
f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

3. Part 3: Project documents and certificates, including the following:
   a. Shop drawings and product data.
   b. Air and water balance reports.
   c. Certificates.

N. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

O. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Mosaic Architecture, Consultants, and GCCM with name of responsible parties; schedule of products and systems, indexed to content of the volume.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with MSU Facilities’s permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of GCCM and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION
SECTION 02 2210 – TREE PROTECTION

PART 1 - GENERAL

1.0 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General conditions, Supplementary Conditions, apply to work of this section.

1.1 DESCRIPTION

The work in this section includes protection, trimming and maintenance of existing trees, shrubs and groundcover that are affected by execution of the Contract Documents, whether temporary or permanent construction.

A. The Contractor assumes responsibility for all coordination of work within the Critical Root Zone (CRZ) of protected trees.

B. Plant protection applies to all trees to remain within the Limit of Work as well as those, which are adjacent to the Limit of work and could be affected by new construction. Work to include:

1. Protection of existing trees and indicated vegetated areas.
2. Watering of existing trees and vegetated areas to be protected.
3. Maintenance of existing and newly installed tree and vegetation protection elements including but not limited to fencing, organic bark mulch, landscape fabric, cabling, and signage.
4. Pruning of existing trees to be protected
5. Removal of pruning debris and other excess material not used. On-site chipping and re-use of pruned material is encouraged.

C. Contractor shall perform all tree protection installation and removal, and any necessary pruning work required for construction under the supervision of the Owner.

1.2 RELATED WORK DESCRIBED ELSEWHERE

A. Section 01500 – Temporary Facilities and Controls
B. Section 31 1000 – Site Clearing
C. Section 02810 - Irrigation System
D. Section 02900 - Landscaping
E. Section 02935 – Lawns and Grass

1.3 DEFINITIONS

A. Tree Protection Zone: Area surrounding individual trees or groups of trees to remain during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

B. Drip Line: The areas encompassing the base of the tree as delineated by an imagined vertical line drawn from the farthest extent of the branches to the ground.

C. Diameter at Breast Height (DBH): Diameter at breast height as measured at four and one-half feet (4'-6") above the existing grade at the base of the tree.

D. Critical Root Zone (CRZ): An area up to one and one-half the radius of the drip line of the tree.
1.4 REFERENCED STANDARDS


D. Alex Shigo, Tree Pruning, Shigo & Tree Associates, LLC, 1989.


G. ANSI A300: Standards for Tree Care Operations, American National Standards Institute.

H. International Society of Arboriculture Best Management Practices publications


1.5 QUALITY ASSURANCE

A. Tree Service Firm Qualifications: An experienced tree service firm with a minimum of five years of experience that has successfully completed tree protection and trimming work similar to that required for this project.

B. Arborist Qualifications: An arborist certified by ISA or licensed in the jurisdiction where the project is located.


1. Owner’s representative shall be notified 24 hours in advance of all pruning, thinning and tree protection work.

D. Pre-Construction Conference: Conduct conference at project site to comply with requirements in ANSI A300 Division 1, Section “Project Management and Coordination.”

1. Before tree protection and trimming operations begin, meet with representatives of authorities having jurisdiction, Owner’s Arborist, Landscape Architect, consultants, and other concerned entities to review tree protection and trimming procedures and responsibilities.

1.6 SUBMITTALS

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

B. Product samples:

1. Tree protection area signage.
2. Cabling materials.
3. Landscape fabric.
4. Organic bark mulch.
C. Tree Pruning Schedule: Written schedule from arborist detailing scope and extent of pruning of trees to remain that are affected by construction.

D. Tree Protection Plan: Contractor shall submit a tree protection plan that confirms that use of the tree protection fencing plan provided in the Contract Documents. Contractor shall notify the Owner of all work activities within the CRZ of trees to be protected, anticipated work methods, proposed tree and root avoidance techniques, and Arborist's on-site confirmation of CRZ for each tree.

1.7 JOB CONDITIONS

A. Site Work Restrictions: In order to prevent excessive soil compaction and destruction of soil structure, no site work will be performed in cases where equipment or traffic must pass over wet soils or if wet soils must be handled or manipulated within the Tree Protection Zone in order for the work to progress. Wet soil is defined as any soil within 85 percent of field capacity (saturation).

B. Utilities

1. Utility locates are required prior to digging and any construction activities.

2. Coordinate work with Owner, including irrigation manager, in order to prevent damage to underground sprinkler system.

1.8 MAINTENANCE

A. Water will be available on site. Provide necessary hoses and other watering equipment required to complete work.

B. Maintain existing plantings and trees by watering, cultivating, weeding, and spraying as necessary to keep landscape in a vigorous, healthy condition.

C. Coordinate watering schedules with irrigation contractor during installation and until final acceptance. Provide deep root watering to newly installed trees.

PART 2 – PRODUCTS

2.0 MATERIALS

A. Topsoil Depth: Natural or cultivated surface-soil layer containing composted organic matter and sand, silt and clay particles; friable, pervious, and black or darker shade of brown, gray or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than two inches in diameter; and free of weeds, roots and toxic and other non-soil materials.

B. Filter Fabric: Manufacturer’s standard, non-woven, pervious, geotextile fabric of polypropylene, nylon, or polyester fibers.

C. Chain-Link Fence:

1. Fencing shall be galvanized chain link as specified below, six feet minimum height. Plastic fencing and wood stakes, or snow fencing are not acceptable.

2. Includes posts, braces, supports and mesh that may be salvaged materials or other used material to form a minimum six foot high enclosure.
3. Posts shall be a minimum diameter of 1-1/2-inch steel pipe.

4. Mesh shall be two inches by two inches by 11 gauge minimum chain link fabric.

5. Use of concrete or metal post piers is permitted.

E. Signage: Provide weather resistant 8-1/2 inches by 11 inches fluorescent green or yellow signs that identify Tree Protection Zone and list restrictions.

F. Cabling: Cabling materials shall meet the ANSI A300 standards for cabling of trees.

G. Tree Tags: Rack track shaped aluminum engraved numbered tags.

H. Organic Mulch: Shall be free from weed seed, sawdust and splinters and shall not contain resin, tannin, wood fiber or other compounds detrimental to plant life. Bagged mulch shall have moisture content not in excess of 22%. Bulk mulch shall have a size range of ½ inch to 1-1/4 inch with a maximum of 20% passing a ½ inch screen. Re-use of organic debris generated during the project is encouraged.

I. Mycorrhizae Fungal Inoculants: “mycogrow gel” as manufactured by Fungi Perfecti, Olympia, WA, 1-800-780-9162, or approved alternate.

J. Slow Release Fertilizer: Osmocote Plus, 15-9-12, or approved alternate.

K. Anti-Desiccant: Protective film emulsion for protection of plant surfaces during transport. Permeable to permit transpiration, as manufactured by Wilt Pruf, Inc., P.O. Box 4280, Greenwich, Connecticut, 06830, or approved alternate. Mixed and applied in accordance with manufacturer’s instructions.

L. Staking and Guying

1. Tie Wire: 12-gauge, galvanized wire

2. Metal posts: 8'-0" t-stakes

3. Nylon strap: three inches wide, 12 inches long white or black nylon strap with one ½” brass grommet in each end or Landscape Architect approved equivalent.

PART 3 - EXECUTION

3.0 INSTALLATION OF TREE PROTECTION FENCING

A. Prior to the start of any construction activity install temporary fencing at the designated tree protection zones to protect existing trees and vegetation to remain from construction damage. Maintain temporary fence and remove when construction (including irrigation and planting) is complete. Owner shall approve fence installation prior to mobilization of the site.

1. Install chain-link fence according to ASTM F 567 and manufacturer’s written instructions. All fencing to be locked securely and only entered with owner’s permission and in consultation with the Owner’s Arborist.

2. Place concrete or metal piers to minimize pedestrian and vehicle circulation and landscape impacts.
3. Provide diagonal bracing to vertical posts at corners of enclosures and wherever needed to ensure rigidity of the fencing.

4. If chain link fabric is used versus chain link panels the chain-link fabric shall be tight to grade at the bottom edge and stretched uniformly between posts. Top of fabric shall be a minimum of six feet above grade. Install fabric to form completely closed area around tree(s). Attach fabric to posts 12 inches on center with 11 gauge wire ties securely fastened, or with bolted ring clips and to top rail not over three feet on center.

B. Fencing shall be installed as follows: In the vicinity of coniferous trees, fenced area shall include an area of a radius from the trunk equal to one and one-half times the radius of the drip line of the tree. In the vicinity of deciduous trees, fenced area shall include an area of a radius from the trunk equal to one and one-half times the radius of the drip line of the tree. For areas with shrubs plants, fenced area shall include the entire edge of the planted area.

C. Area within tree protection fencing must be mulched with organic bark mulch to a depth of four inches.

D. Attach orange flag strips 12 inches long at three feet on center along the fence, five feet above grade.

E. Place tree protection signs at thirty-foot intervals along fence with a minimum of one sign if the fence is less than 30 feet in length.

3.1 FENCE MAINTENANCE AND REMOVAL

A. Maintain fence in specified location and in good condition until completion of site operations and of delivery of equipment and material, except where directed otherwise in writing by Owner’s representative.

B. Fencing shall be immediately repaired when damaged.

C. Remove protection fencing at Substantial Completion.

3.2 USE OF AREA WITHIN FENCE

A. Do not use area within fence for operation, storage, vehicles, or foot traffic. Contractor shall notify Owner’s representative 24 hours in advance of the need to move a tree protection fence or access inside of it.

B. Do not alter grades within the required protective fence line except as directed during the fine grading operations at the conclusion of site development.

C. Control soil moisture within the protected area. Prevent flooding, ponding, erosion, or excessive wetting of the soil and root systems caused by dewatering operations. Protect root areas from leachate, concrete, oil, fuel, lubricating oil, and from other contaminants.

3.3 USE OF AREA ADJACENT TO FENCE

A. Do not store materials potentially harmful to tree roots within 20 feet of protected areas. Potentially harmful materials include, but are not limited to petroleum products, cement and concrete materials, cement additives, lime, paints coating, waterproofing agents, from coatings, detergents, acids, and cleaning agents.

B. Notify owner’s representative of all heavy equipment work to be performed within the CRZ.
1. Tie-back all flexible limbs and branches, which may be damaged during construction, under the direction of the Owner's representative.

2. Use compaction mitigation strategies such as planking, mulch, or plating as directed by the Owner's representative.

3.4 DAMAGES FOR LOSS OR INJURY TO TREES

A. Trees removed or damaged and deemed unviable, during demolition or construction, are to be replaced following consultation with Owner's Arborist or Owner's representative.

B. Trees removed during demolition or construction are to be replaced following consultation with Owner's Arborist or Owner's Representative. Appraised values of existing trees have been determined according to industry standards and will be provided by the Owner if applicable.

C. Contractor is to replace any and every tree lost or irreparably damaged as a result of failure of the Contractor to protect or to adequately maintain existing trees. Trees that fail to fully foliate in the spring following completion of construction operations may be presumed to have been lost due to construction operations.

D. In the event of injuries to the crown, trunk or root system of any tree to remain that are the result of the Contractor’s failure to protect and/or maintain such tree, the Owner’s Representative may elect to retain the tree and hold the Contractor liable for compensation.

E. Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots according to Owner’s Arborist’s written instructions. Work required by the Owner’s Arborist shall be performed by the Contractor at no additional cost to the Owner.

F. Trees, which are removed without authorization, shall be replaced with a tree of the same size and species. If a tree of the same size and species is not available the Owner’s Representative shall provide alternatives. If a tree cannot be replaced because the size exceeds the maximum which can be relocated using latest technology, the Contractor shall compensate the Owner at amount equal to the appraised value.

G. Should replacement work of large trees be required as a result of Contractor’s failure to protect or maintain trees, a subcontractor specializing in relocating large trees shall conduct all replacement work. Submit qualifications of tree relocation Contractor to the Owner’s Representative. The cost of the subcontractor will be at the Contractor’s expense.

H. Completely remove and dispose of any tree killed or irreparably damaged as a result of Contractor’s failure to protect or maintain trees. Remove those trees damaged or killed as a result of vandalism, natural acts or other causes. Removal and disposal shall include stumps and roots to a depth of two feet below finished grade.

3.5 PRUNING OF EXISTING TREES

A. Limbs and branches that have been broken shall be cut off cleanly above the nearest crotch in accordance with International Society of Arboriculture (ISA) standards. Cut limbs and branches greater than one-half inch in diameter. Sterilize equipment with alcohol prior and during trimming and pruning operation. All pruning of damaged trees shall be carried out to the complete satisfaction of the Owner’s Representative.

B. The Contractor shall provide a ISA certified professional to assess and recommend treatment of any damage to trunks or major limbs three inches in diameter or over.
C. All existing trees to be saved shall be limbed and pruned by a ISA certified Arborist. Limbs shall be pruned to ensure safety and promote health of the tree. Inform the Owner’s Representative prior to commencement of pruning.

3.6 EXCAVATION

A. Install shoring or other protective support systems to minimize sloping or benching of excavations.

B. Do not excavate within Tree Protection Zones, unless otherwise indicated.

C. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks and comb soil to expose roots. Work shall be performed under the supervision of the Owner’s representative.

1. Redirect roots into backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately three inches back from new construction.

2. Do not allow exposed roots to dry out before placing permanent backfill. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with approved soil.

   a. Straw Mulch: Thoroughly wet excavated sub-grade where roots of existing trees to remain have been exposed. Apply four inches of wet organic bark mulch on horizontal area and wet burlap mats along exposed trench sides.

   b. Watering and Maintenance: Thoroughly and evenly water protected areas at a rate not to exceed two inches per hour during dry periods. Coordinate water procedures and schedules with the Owner’s Representative or the Project Manager. Maintain root protection procedures throughout the term of the Contract, as required.

D. Where utility trenches are required within tree protection zones, tunnel under or around roots by drilling, auger boring, pipe jacking, or digging by hand.

   1. Root Pruning: Do not cut roots larger than 1” without notifying Owner’s representative; Cut roots smaller than 1” in accordance with ISA standards.

3.7 POST CONSTRUCTION TREE MAINTENANCE

A. Ensure that existing trees remaining on the project site shall be in as good condition at completion of the work as at the commencement of the work. If such a condition does not exist at the completion of the work, assume responsibility to provide corrective actions or replacement with new material as directed by the Owner’s Representative.
SECTION 02 2810
IRRIGATION SYSTEM

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of each Contract, including General Conditions and Supplementary Conditions, apply to work of this section.

1.02 DESCRIPTION

The work of this section consists of all items necessary to install the proposed irrigation system as indicated on the plans, and the protection and splicing required to maintain all parts of the existing irrigation system in operation, with the exception of those parts designated to be removed or abandoned. This includes required sleeves for pipe and wire, back-flow prevention devices, reconnections, and miscellaneous modifications to the existing irrigation distribution lines including, but not limited to:

A. Automatic controller and remote control valves.
B. Lawn and planting beds sprinkler system.
C. Connection to proposed irrigation water source and power supply.

1.03 RELATED WORK DESCRIBED ELSEWHERE

A. Site Clearing Section 02230
B. Earthwork/Restoration Section 31 0000
C. Landscaping Section 02900
D. Lawns and Grass Section 02935

1.04 QUALITY ASSURANCE

A. Qualifications of Installer

Provide at least one person 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 materials of installation and who shall direct all work performed under this section. All work of this section and related work listed above shall be performed by the same CONTRACTOR.

B. Codes and Standards

1. In addition to complying with all pertinent codes and regulations, comply with the latest rules of the National Electrical Code for all electrical work and materials.

2. Comply with National Plumbing code at all connections to potable water systems.

3. Where provisions of pertinent codes and standards conflict with the requirements of this section of these Specifications, the more stringent provisions shall govern.

1.05 SUBMITTALS
A. **Material List**

Before any irrigation system materials are delivered to the job site, submit to the ENGINEER a complete list of all irrigation system materials to be furnished and installed.

1. Show manufacturer’s name and catalog number for each item, furnish complete catalog cuts and technical data, and furnish the manufacturer’s recommendations as to method of installation. Where materials proposed differ from those specified, furnish complete shop drawings and design calculations to demonstrate equivalent performance of the proposed installation.

2. Do not permit any irrigation system component to be brought onto the job site without prior approval by the ENGINEER. Provide one sample of each element of the system to the ENGINEER for approval (sprinkler heads, valves, couplings, etc.). These samples will be returned to the CONTRACTOR, and if approved, may be used in the project.

B. **Shop Drawings**

CONTRACTOR shall submit Five (5) copies of the proposed sprinkler layout in a schematic form to the ENGINEER for approval. Any modifications to these proposed drawings will be returned to the CONTRACTOR for the preparation of five (5) copies of the final revised layout. The material list will be coordinated with the final shop drawings by the CONTRACTOR. Show all sleeve locations.

C. **Field Verification**

CONTRACTOR shall field verify all dimensions, existing and proposed conditions, and as required to provide one complete and operable system. Proposed system shall be laid out above ground using locate flags to show location of all sprinkler heads, valves, and sleeve locations. This layout shall be signed off on by MSU Irrigation Manager before any excavation shall begin.

D. **As-built Drawings**

Provide a complete set of Mylar reproducible as-built shop drawings to the ENGINEER for approval prior to final payment.

### 1.06 PRODUCT HANDLING

A. **Protection**

Use all means necessary to protect irrigation system materials before, during, and after installation and 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.

### 1.07 PERFORMANCE REQUIREMENTS

A. **Minimum Requirements**

The following shall be the minimum requirements of the system. They are not intended to
limit the overall intent, which is to obtain a fully operational and completely automatic sprinkler system. Specific requirements of this project manual shall apply to all elements typically. Conflicts between the drawings and the project manual or between specific and general performance of material requirements shall be assumed to be the most expensive.

B. Project Zones

Refer to the drawings for the general zones to be served by this system.

1. Irrigation layout must be adaptable to the future modification of the system to smaller heads, more intense head arrays and minimal spraying over the sidewalks. This should be accomplished by running the laterals near sidewalk edges whenever possible, and by positioning the mains with this future intent.

2. CONTRACTOR will advise himself of all existing and proposed site conditions and related planting and grading as required to coordinate and schedule with the work of other contractors.

3. Heads shall be positioned to prevent damage from spraying on the building envelope and/or causing inside flooding in any and all cases.

4. Organize zones to allow walking across the area on dry sidewalk while the irrigation system is on.

PART 2 - MATERIALS

2.01 PIPE

A. Plastic Pipe

1. Plastic pipe shall be rigid non-plasticized Schedule 40 PVC IPS solvent-welded conforming to ASTM D-1784 and D-2241 standard specifications for PVC plastic pipe. The pipe shall be homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, deleterious material, wrinkles, and dents.

2. All pipes shall be continuously and permanently marked with the following information:

   Manufacturer's name or trademark, size, schedule and type of pipe, working pressure at 73 deg. F and National Sanitation Foundation (N.S.F.) approval.

3. All main lines shall be a minimum of two inches (2") in diameter.

4. All lateral lines shall be a minimum of one and one-half inches (1-½") in diameter.

5. All plastic pipe fittings to be installed shall be molded fittings manufactured of the same material as the pipe, rated as a pressure fitting (no DWV fittings shall be allowed) and shall be suitable for solvent weld, slip joint ring-tite seal, or screwed connections. All pipe six inches (6") in diameter and above shall be Schedule 40 PVC IPS gasket end. All smaller pipes shall be Schedule 40 PVC IPS solvent-welded.

6. Slip fitting socket taper shall be so sized that a dry unsoftened pipe end, conforming to these specifications, can be inserted no more than halfway into the socket. Plastic saddle and flange fittings will not be permitted. Only schedule 80 pipe may be threaded.
7. When connection is plastic to metal, plastic male adapters shall be used. The male adapter shall be hand tightened, plus one turn with a strap wrench. Joint compound shall be Teflon Tape on Water Based Teflon Paste.

8. All mainline pipes shall be traceable via purple or blue-colored 14 gauge single strand direct burial wire attached to the pipe. The tracer wire shall surface at and be secured to the controller. This is not necessary for lateral pipelines with irrigation heads attached.

B. Pipe Sleeves

Pipe sleeves shall be Schedule 40 PVC pipe, six-inch (6") diameter unless noted otherwise, or equal approved by ENGINEER.

1. Installation

Provide empty sleeves along all pathways as noted on the drawings or every 100 feet. Extend sleeves at least one foot (1') beyond pavement on both sides. Sleeves shall be installed 18 inches below finished grade. Cap ends of empty sleeves with duct tape.

2. Sleeve Location Marking

a. New Pavement

The location of each sleeve must be marked along both of the extreme edges of any new pavement installed over the sleeve. This shall be accomplished by pressing the end section of a two-inch (2") pipe into the uncured pavement surface to make an imprint.

b. Existing Pavement

For sleeves pushed under existing pavement, sleeve locations shall be marked along the extreme edges of the pavement on both sides where the sleeve emerges from under the pavement. Markings shall consist of scoring the surface of the existing pavement with a 2" O.D. core drill just enough to make the impression of a circle in the pavement surface.

2.02 RISERS/SWING JOINTS

A. Flexible Risers

Stationary Pop-up and Surface Sprinkler Heads shall be installed using “funny pipe” or four-piece swing joints. Sprinkler Heads with one-half inch (1/2") and/or three-quarter inch (3/4") inlets shall connect with “funny pipe” exclusively, in lengths no longer than three feet (3'). Sprinkler Heads with one-inch (1") inlets shall connect with four-piece swing joints only.

1. Installation with “funny pipe”, which is one-half inch (1/2") low density, polyethylene pipe, rated 80 PSI at 100 deg. F, must use Teflon-taped barbed street ells. Use of flexible pipe such as “funny pipe” is limited to connecting laterals to irrigation heads.

2. Four-piece swing joints shall consist of an assembly using three (3) one inch (1") Marlex street elbows, with a 1" SCH 80 Nipple of required length to set head at grade.

B. Rigid Risers

All risers for shrub spray heads, bubblers, etc., that are in shrub or flowerbed areas and
planters, shall be schedule 80 PVC plastic pipe, unless otherwise specified or shown on the plans. The risers shall be of sufficient height so as not to cause any interruption of the stream from the sprinkler nozzle when the plant material has reached its optimum growth.

2.03 VALVES

A. Ball Valves

1. All manual ball valves, sizes 1-1/2” inches and smaller, shall be all bronze double with integral taper seats and with rising stem.

2. All valves 2” and larger shall be gate valves.

3. All ball valves shall be full port, with chromium or stainless ball with Teflon seats 150 PSI rated, Hammond, or approved equal.

B. Pressure Reducing Valves

Provide pressure-reducing valves on main lines only, Watts, Series U5, U5B ½” to 2” Standard Capacity, or approved equal.

C. Gate Valves

1. All manual gate valves, sizes four-inch (4”) and smaller, shall be made in the U.S.A., brass body, threaded, non-rising stem, full port, 200 PSI/13.8 bar non-shock cold working pressure up to 180 deg. F./82 deg. C., NSF/ANSI 61-8 compliant: NIBCO model T1-8 or approved equal.

2. All gate valves of 6-inch (6”) size or larger shall be at least 150 PSI rated, AWWA-C509 resilient wedge gate valve, made in the U.S.A., featuring non-rising stem, iron body, epoxy coated interior, mechanical joint with appropriate size gaskets for corresponding pipe as per drawing.

D. Quick-Coupler Valves

Provide Rain Bird #3 DNP Quick Coupler valves.

E. Automatic Remote Control Valves

Automatic control valves shall consist of:

1. Rain Bird PESB Series, 24 volt, contamination resistant valve with a pressure operating range of 20-200 psi and a 0.25 to 200 gpm flow range. Glass-filled nylon construction, one-piece solenoid with captured plunger, flow control handle adjusts, manual internal and external bleeds, nylon screen scrubber and purple flow control handles for easy identification of non-potable water systems or approved equal.

F. Back-Flow Preventers

Back-flow on potable systems only shall be Rain Bird Model DCA2–0-OR or approved equal.

2.04 VALVE BOXES

All remote control valves, pressure regulating valves, manual control valves, zone shut-off valves,
gate valves or globe valve filters and drains, unless otherwise indicated, shall be installed in a valve access box of proper size as required for easy access to the valve. Valve box to be Carson, with round, locking green cover ten inches (10”) in diameter for quick coupler valves, and 10” x 15” standard for all others unless described otherwise in the contract drawings, or approved equal. All round valve boxes shall be supported underneath the bottom edges with two bricks (minimum). All rectangular valve boxes shall be supported underneath the bottom edges with three bricks (minimum).

2.05 AUTOMATIC IRRIGATION CONTROLLER

A. Controller Type

The automatic controller shall be 120 volt input, soft-wired, 26.5 volt output, with the number of valve stations and in the type and model number indicated on the plans, and shall be a Rain Bird ESP SAT LS or ESP SAT LW. Wall or pedestal mount type must be pre-approved by the ENGINEER and OWNER for the site situation. Controller station size and quantity specified per drawing. Station wiring and timing schedule specified per drawing. All station wiring must be terminated in a Rain Bird ESPSATOB24 mounted in the pedestal or wall mounted wire trough. All controllers must be equipped with a Rain Bird RMK450NARR with a University licensed and authorized frequency, hooked to a Rain Bird MaxiLink Ant 01 or Antenex Directional Yagi Model Y4503/Y4505 or University approved substitute.

B. Electrical Power

Power for the controllers shall be the responsibility of the sprinkler installer. Meet all electrical specifications for installation of controllers and power to the controllers. The controllers must be wired to the power source in the pedestal or wall via an Isobar Ultra 4 surge protector and a two-receptacle Ground Fault Interrupter (GFI) outlet. A pigtail that can reach from the controller to the outlet is required. Power source must be pre-approved by Owner prior to connection.

C. Sleeves

1. Provide minimum of six inches (6”) diameter sleeves under paved areas as necessary to run all control wiring and piping for sprinkler zones. Coordinate with concrete work prior to forms being set.

2. No sleeving shall be put in tunnel walls. All main lines fed from the tunnel shall be cored, and sized to fit link seals for that pipe size. Each mainline shall be sealed using 2 link seals, one on the inner wall and one on the outer wall. No fittings allowed within 3’-0” of outer tunnel wall.

D. Location

After pre-approval by the ENGINEER and OWNER, locate controllers on outside walls of buildings or on pedestals at locations that will maximize the view of the zones serviced by each controller. Verify locations with the ENGINEER to avoid compromising buildings systems and/or appearance concerns.

Pedestal controllers must be mounted to a concrete slab of dimensions 1.5’ x 1.5’ x 0.33’. Each pedestal slab shall have a minimum of 2 electrical sweep 90’s poured into it. First; one 1” sweep shall hold 120V direct bury power wires, second, one 2” sweep shall hold valve control and flow meter wires- additional or larger sweeps shall be installed as needed to
avoid wire damage. Two bollards consisting of three inch (3") steel pipe filled with concrete and anchored in concrete shall be installed against the edge of the slab in front and in back of the controller. The bollards shall be primed and painted with a black, epoxy-based paint. The concrete at the top of the pipe must be domed and finished to a smooth, even surface, without concrete residue on the outside surface of the pipe.

E. Flow Meter

A MaxiCom-compatible flow meter must be installed at every point of connection. This may be either a Rain Bird Brass Insert Sensor (FS350B) for pipe three inches or larger, or a Rain Bird PVC Tee Sensor of the appropriate size: FS150P for 1-1/2” pipe, FS200P for 2’ pipe, and FS300P for 3” pipe. The flow meter must be directly connected to the controller using PE43 communication cable (the blue/blue white wire pair must be used for the flow meter/pulse transmitter connection) and a PT 322 pulse transmitter. All splices using this type of cable must meet Rain Bird MaxiCom standards. Programming and hook up of the PT322 shall be completed by MSU Irrigation Employee.

F. Certified Installation

All MaxiCom components must be ordered and installed by a MaxiCom-certified installer.

2.06 IRRIGATION HEADS

A. Rotary Sprinklers

Rotary sprinkler heads shall be Model I-20 R Series, manufactured by Hunter Industries, San Marcos, California; or Rain Bird 5000 Series PLPCSAMNP, 5505 NP; or 8005NP Series, manufactured by Rain Bird Sprinkler Mfg. Corp., Glendora California or approved equal. Height specified should be reflective of height of vegetation irrigated.

B. Spray Heads

Spray head sprinklers shall be Rain Bird Model Nos. 1800 Series SAM or with variable arc nozzles (VAN) or MPR nozzles, manufactured by Rain Bird Sprinkler Mfg. Corp., Glendora California or approved equal. Height specified should be reflective of height of vegetation irrigated.

C. Bubblers

All bubbler zones must be controlled by a Rain Bird PESB Series Valve incorporating a Rain Bird PRS regulator. There must be a Rain Bird WYE Filter System installed directly downstream of the valve, located inside the valve box in a manner that allows easy maintenance. The bubbler heads must be Rain Bird 1300A-F Series mounted on Rain Bird 1804 SAM Spray Bodies or approved equal.

D. Drip Irrigation

No drip irrigation systems are allowed at Montana State University.

2.07 CONTROL CABLE

A. Type

All electrical control and ground wire shall be Baron irrigation control cable or approved equal, 14-gauge unless otherwise indicated on the drawings. All wiring to be used for
connecting the automatic remote control valve to the automatic controllers shall be Type “UF”, 600 volt, solid copper, single conductor wire with PVC or polyethylene insulation and bear UL approval for direct underground burial feeder cable.

B. Insulation

Insulation shall be four-sixty-fourths inch (4/64") thick minimum covering of ICC-l00 compound for positive waterproofing protection. All control or “hot” wires shall be red and all common or “ground” wires shall be white. A black extra wire shall be included in the wiring run for every four (4) wires installed.

C. Code Compliance

Verification of wire types and installation procedures shall be checked to conform to local codes.

D. Splices

All splices are to be completed within valve boxes using one-piece, jelly-filled, water-proof wire connectors with 20 expansion coils per splice, allowing work to be completed at ground level. All splices shall be located on as-built drawings.

E. Trench Installation

1. Tape and bundle all wiring at ten-foot (10’) intervals.

2. Attach tracer wire to main line pipe only at ten-foot (10’) intervals.

3. All 120 volt wiring shall be in conduit with marker tape installed in the ditch six inches (6") above the conduit.

4. All wiring under pavement and through sleeves shall be in conduit.

5. Tie a loose twenty-inch (20") loop in wiring at all changes in direction greater than 30 degrees. Untie all loops after making connections.

### 2.08 VAULTS

A. Water Service Connection

A vault shall be installed at domestic water service connection. Vault shall house domestic water back-flow preventers, blowout assembly and isolation valves. Vault must comply with applicable code(s).

B. Location

Review location of vault with ENGINEER prior to installation.

### 2.09 OTHER MATERIALS

A. Tools To Be Furnished

1. Supply as part of this contract the following tools:
a. Two keys for each automatic controller

b. Two quick-coupler keys, Rain Bird Model 33K with matching hose swivels.

2. The above equipment shall be turned over the OWNER at the conclusion of the project. Before final inspection can occur, evidence that the OWNER has received materials must be shown to the ENGINEER.

B. Concrete

Provide and coordinate installation of all concrete thrust blocks. Refer to Division 3 for concrete requirements. Provide thrust blocks for all lines larger than 3-inch diameter, at all tees and ells.

C. Other Materials

All other materials not specifically described but required for a complete and proper irrigation system installation, shall be new, first quality of their respective kinds, and subject to the approval of the ENGINEER.

PART 3-EXECUTION

3.01 SURFACE CONDITIONS

A. Inspection

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that such work is complete to the point where this installation may properly commence.

2. Verify that irrigation system may be installed in strict accordance with all pertinent codes and regulations, the original design, the referenced standards, and the manufacturer’s recommendations.

B. Discrepancies

1. In the event of discrepancy, immediately notify the ENGINEER.

2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 FIELD MEASUREMENTS

Make all necessary measurements in the field to ensure precise fit of items in accordance with the original design.

3.03 TRENCHING AND BACKFILLING

A. General

1. Perform all trenching required for the installation of items where the trenching is not specifically described in other sections of these specifications.
2. Make all trenches in accordance with OSHA Requirements with sufficient width to provide free working space at both sides of the trench and around the installed item as required for gluing, joining, backfilling, and compacting while minimizing width of trenches.

3. The CONTRACTOR will be required to conduct his work so that trenches will remain open a minimum possible time.

B. **Depth**

1. Trench as required to provide the elevations shown on the Plans.

2. Trench to sufficient depth to give a minimum of eighteen inches (18") of fill above the top of the pipe measured from the adjacent finished grade under driveways and sidewalks.

3. All mainline and control cables shall have a minimum cover of eighteen inches (18") above the pipe or wire. All laterals shall have a minimum cover of twelve inches (12") above the pipe.

4. All sleeves shall be installed at a depth on line and grade with existing or proposed irrigation lines. Sleeves with excessive or shallow invert depth will be rejected.

C. **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 to the approval of the ENGINEER and at no additional cost to the OWNER.

D. **Trench Bracing**

1. Properly support all trenches in strict accordance with all pertinent rules and regulations.

2. 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 will be fully protected from damage.

3. In the event of damage to such improvements, immediately make all repairs and replacements necessary to the approval of the ENGINEER and at no additional cost to the OWNER.

4. Arrange all 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 proved sufficient strength.

E. **Removal of Trench Bracing**

Exercise care in the driving and removal of sheeting, shoring, bracing, and timbering to prevent collapse or caving of the excavation faces being supported.

F. **Grading and Stockpiling Trenched Material**

1. Control the stockpiling of trenched material in a manner to prevent water from running into the excavation.
2. Do not obstruct surface drainage but provide means whereby storm and wastewater are diverted into existing gutters, other surface drains, or temporary drains.

G. Methods

1. All trench excavation shall be made by open cut. During excavation, material suitable for backfilling shall be piled in an orderly manner, a sufficient distance from the banks of the trench to avoid overloading, and to prevent slides or cave-ins. All material not required for backfill or not suitable for backfill shall be removed from the site by the CONTRACTOR. Banks of trenches shall be kept as nearly vertical as possible, and shall be properly sheeted and braced as may be necessary to prevent caving.

2. The CONTRACTOR shall provide, place and maintain all necessary barricades, warning signs, and other safety devices to prevent pedestrians from falling in open trenches.

3. Trench widths in paved streets or in areas where proximity to other structures requires vertical cuts, shall not be wider than is required for proper handling, jointing and bedding of the pipe.

4. The bottom of the trenches shall be accurately graded to line and grade, and provide uniform bearing and support for each section of the pipe on undisturbed soil, at every point along its entire length. Depressions for joints shall be dug after the trench bottom has been graded, and shall be only of such length, depth, and width as required for properly making the particular type joint. Care shall be taken not to excavate below the depths indicated.

5. Where rock occurs in trench excavation, the rock shall be removed to a depth of six inches (6") below the established grade line, and to a width of twelve inches (12") greater than the outside diameter of the pipe to be installed in the trench.

6. No water shall be permitted to rise or stand in trenches not yet backfilled until after the pipe has been placed, tested and covered with backfill for a depth of at least ten inches (10"). Any pipe having its alignment or grade changed as a result of a flooded trench shall be removed and re-laid after the trench is graded once again at not additional cost to the OWNER.

H. Pavement Removal

1. Where excavation of trenches requires the removal of pavement, the pavement shall be cut in a straight line along the edge of the excavation by use of a spade-bit air hammer, concrete saw or similar approved equipment to obtain straight, square and clean break. After backfilling and sub grade preparations are completed, the pavement section and surfacing shall be replaced.

2. Excess material, including rock, broken concrete, bituminous materials, debris, or other materials not suitable for backfill, shall be removed from the site and disposed of by the CONTRACTOR.

3.04 BORING

A. Locations

Boring shall be used to route pipe, wiring, or both under structures such as walks or curbs where trenching is impractical. Sleeves shall be installed in all bored holes.
B. Method

Boring shall be accomplished with a drill, auger, water jet, or any other instrument approved by the ENGINEER capable of producing a precise hole. Boring shall not disturb overlaying structures or cause settlement and damage to those structures.

3.05 SLEEVES

A. Locations

Sleeves shall be installed wherever routing of a pipe, wiring, or both crosses a paved area or passes through a bored hole.

B. Methods

1. Sleeves laid in open trenches shall be uniformly and evenly supported by undisturbed soil on the trench bottom. Backfill shall conform to standards hereinafter specified.

2. Sleeves installed in borings shall be forced through and shall have a snug fit throughout the length of the bored hole. Sleeves cracked or broken shall not be accepted.

3.06 BACKFILL

A. Material

Backfill material shall be free of clods, lumps of frozen material, or stones larger than one-inch (1") in their maximum dimension. The bedding and select material under, around and six inches (6") above the top of the pipe shall be placed by hand in maximum layers of six inches (6") and carefully compacted in a manner which will not displace the pipe. Compaction of the select backfill shall be at least ninety percent (90% ) of the maximum density as determined by AASHTO T-180. Water settling will not be allowed.

B. Inspection

The trenches shall not be backfilled until inspection has been completed and the pipe installation, including the grade, alignment and jointing has been found to be in compliance with the requirements of the plans and specifications.

C. Around and Over the Pipe

1. Select backfill material consisting of sand, fine gravel or select earth, free of large lumps or rocks larger than three-quarters of an inch (¾") shall be used in backfilling around and over the installed pipe.

2. The select material shall be obtained from the excavation material removed from the trench and shall be processed by screening, sifting, or selective sorting, so as to produce the type of backfill herein specified. The CONTRACTOR may at his option and expense provide an acceptable imported material.

3. This backfill material shall be carefully deposited around and over the pipe in layers not more than six inches (6") thick, loose measurement, unless otherwise permitted by the ENGINEER, wetted to optimum moisture content and uniformly compacted to at least ninety-five percent (95%) of the maximum density obtainable at optimum moisture.
content as determined by ASTM D698 (latest revision), until the pipe has a cover depth of at least one foot (1’).

D. **Remainder of Trench Backfill**

1. The remaining depth of the trench shall be backfilled with excavation material removed from the trench, which shall be wetted or dried to near optimum moisture content.

2. This material shall be carefully deposited in layers not to exceed six inches (6”) in compacted thickness and compacted to at least ninety-five percent (95%) of the maximum density as determined by ASTM D698 (latest revision). The method of compaction selected by the CONTRACTOR shall not cause damage of any nature to the installed pipe. Replace topsoil on trench fill and compact to eighty-five percent (85%) of maximum density at optimum moisture.

3. The use of water settlement for this portion of the trench backfilling is permissible if the specified density can be obtained and the backfill material is suitable for this type of trench compaction.

3.07 **INSTALLATION OF PIPING**

A. **General**

1. Layout the piping system in strict accordance with the Plans.

2. Where piping is shown on the Plans to be under paved areas but running parallel and adjacent to planted areas, the intention is to install the piping in the planted areas.

B. **Line Clearance**

1. All lines shall have a minimum clearance of four inches (4”) from each other, and six inches (6”) from lines of other trades, except through pipe sleeves.

2. Parallel lines shall not be installed directly over one another.

C. **Inspection of Pipe and Fittings**

Carefully inspect all pipe and fittings before installation, removing all dirt, scale, and butts and reaming as required; install all pipe with stamped markings oriented up to allow visual inspection and verification.

D. **Plastic Pipe**

1. Plastic pipe shall be installed in a manner so as to provide for expansion and contraction as recommended by the manufacturer.

2. All plastic pipe joints shall be solvent-weld joints or gasket fit joints. Only the solvent cement recommended by the pipe manufacturer shall be used and it must be a two-part system consisting of primer and cement. No single part cement system shall be used. All plastic pipe and fittings shall be installed as outlined and instructed by the pipe manufacturer and it shall be the CONTRACTOR’s responsibility to make arrangements with the pipe manufacturer for any field assistance that may be necessary. The CONTRACTOR shall assume full responsibility for the correct installation.
3. All plastic (PVC) to metal joints shall be made with plastic threaded male adaptors into metal threaded female fittings.

4. The solvent-weld joints shall be made on dry pipe.

5. The solvent-weld joints shall be allowed to set at least 24 hours before pressure is applied to the system on PVC pipe.

E. Copper Pipe

Direct buried copper pipe connections shall be made using silver solder.

F. Thrust Blocks

Provide concrete thrust blocks for all pipes as shown on the plans. All thrust blocks shall bear directly on undisturbed earth. Center the pipe in the middle of the thrust block.

3.08 INSTALLATION OF Equipment

A. General

1. All fittings, valves, etc., shall be carefully placed in the trenches with concrete thrust blocks, placed where required.

2. All sprinklers, having adjustable nozzles, shall be adjusted for proper and adequate distribution of the water over the coverage pattern of the sprinkler.

3. All nozzles on stationary pop-up sprinklers or stationary spray heads shall be tightened after installation. All sprinklers having an adjusting screw, adjusting stem or adjusting friction collars shall be adjusted as required for the proper arc of coverage, radius, diameter and/or discharge.

4. All control wires shall be clearly labeled by station, using weatherproof material, at the controller and at the valve ends. Mark the underside of all valve box covers, indicating the valve controller station number. All markings shall be made in a neat and legible manner using white enamel paint.

5. All control or “hot” wires shall be red and all common or “ground” wires shall be white. A black extra wire shall be included in the wiring run for every four (4) wires installed.

B. Sprinkler Heads

1. Install lawn sprinkler heads where indicated on the plans and in strict accordance with the manufacturer’s recommendations and as necessary to provide complete uniform coverage and precipitation.

2. Upon completion of installation, reset all lawn sprinkler heads flush with grade and firmly anchored with soil.

C. Master Automatic Control Valves

A master automatic control valve shall be installed at the point of connection to the main for any remotely controlled portion of the irrigation system. In cases where there are multiple
points of connection, a master valve shall be installed for each, with no more than three points of connection allowed.

3.09  TESTING AND INSPECTION

A.  Covering or Enclosing Work Prior to Inspection

Do not allow or cause any of the work in this section to be covered up or enclosed until it has been inspected, tested, and approved by the OWNER's Representative.

B.  Flushing

Before backfilling the mainline, and with all control valves in place, but before lateral pipes are connected, completely flush and test the mainline and repair for all leaks; flush out each section of lateral pipe before sprinkler heads are attached.

C.  Testing

1.  Make all necessary provisions for thoroughly bleeding the line of air and debris.

2.  After valves have been installed, test all live water lines hydrostatically for leaks at a pressure of one hundred fifty (150) psi for a period of two (2) hours, with all couplings exposed and with all pipe sections center loaded.

3.  Furnish all necessary testing equipment and personnel.

4.  Correct all leaks and retest until acceptance by the ENGINEER.

D.  Final Inspection

1.  Thoroughly clean, adjust, and balance all systems.

2.  Demonstrate the entire system to the ENGINEER and OWNER, proving that all remote control valves are opening and closing on command, that all heads are properly adjusted for radius and arc of coverage, that all emitters are functioning, and that the installed system is workable, clean, and efficient.

3.  Existing irrigation system(s) or portions of systems which have had their performance altered by any of the work related to this project shall be repaired or adjusted using materials and installation methods in accordance with this specification and in a manner to restore head-to-head sprinkler coverage, uniform precipitation rates, control zone integrity, and elimination of the spraying of water on building walls and sidewalks.

3.10  PAVEMENT REPLACEMENT

Pavement replacement shall utilize the same materials and design as the original pavement.

3.11  CLEANUP

Upon completion of the work, the entire site shall be cleared of all debris, and ground surfaces shall be finished to smooth, uniform slopes and shall present a neat and workmanlike appearance. Cleanup shall be considered an incidental item, and no additional payment shall be made for any cleanup item. All improvements or other obstructions removed during construction shall be replaced in a condition at least equal to their existing condition.
3.12 MAINTENANCE

A. The CONTRACTOR shall, for a period of one (1) year after completion and final acceptance of the work, maintain and repair any trench or boring settlement which may occur, and shall make suitable repairs to any pavements, or other structures which may become damaged as a result of settlement. All such maintenance and repair shall be at the CONTRACTOR’s expense.

B. The CONTRACTOR shall inform the OWNER of the location and the nature of all damage done to the existing irrigation system not slated for demolition within eight hours of the occurrence of the damage.

C. The CONTRACTOR shall maintain the existing and proposed irrigation system in operation during the construction period. Upon completion of the proposed irrigation work the CONTRACTOR shall balance and adjust the entire (new and existing) system.

3.13 AS-BUILT DRAWINGS, CHARTS AND EQUIPMENT MANUALS

A. Record Drawings

1. Record accurately on one set of black and white prints of the site plan all installed work including both pressure and non-pressure lines.

2. Upon completion of each increment of work, transfer all such information and dimensions to the print. The dimensions shall be recorded in a legible and workmanlike manner.

3. Dimension from two permanent points of reference (buildings, monuments, sidewalks, curbs, pavement, etc.). Locations shown on as-built drawings shall be kept day-to-day as the project is being installed. All dimensions noted on drawings shall be one-eighth-inch (1/8”) in size (minimum).

4. Show locations and depths of the following items:

   Point of connection
   Routing of pressure lines (max. dimension=one hundred feet {100’} along lines)
   Gate valves
   Sprinkler control valves
   Quick coupling valves
   Routing of control wires
   Sprinkler heads
   Other related equipment

5. Maintain as-built drawings on site at all times.

6. Make all notes on drawings in pencil (no ball point pen).

B. Controller Charts

1. ENGINEER must approve as-built drawings before charts are prepared.

2. Provide one controller chart for each controller supplied showing the area covered by automatic controller, of the maximum size controller door will allow.
3. The chart is to be a reduced drawing of the actual as-built system.

4. Chart shall be black line print and different colored shading used to show area of coverage for each station.

5. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic.

6. The chart shall be mounted using Velcro or equal type of semi-permanent fastening device.

7. These charts must be completed and approved prior to final acceptance of the irrigation system by the OWNER.

C. Operation and Maintenance Manuals

1. Prepare and deliver to the ENGINEER within ten calendar days prior to completion of construction, all required and necessary descriptive material in complete detail and sufficient quantity, properly prepared in two (2) individually bound copies of the operations and maintenance manual. The manual shall describe the material installed and shall be in sufficient detail to permit operating personnel to understand, operate and maintain all equipment. Spare parts lists and related manufacturer information shall be included for each equipment item installed. Each complete, bound manual shall include the following information:

   a. Index sheet stating CONTRACTOR’s address and telephone number, duration of guarantees period, list of equipment with names and addresses of local manufacturer representatives.

   b. Complete operating and maintenance instructions on all major equipment.

   c. System start-up and shut down instructions.

2. In addition to the above maintenance manuals, provide the maintenance personnel with instructions for system operation and show written evidence to the OWNER at the conclusion of the project that this service has been rendered.

3.14 GUARANTEE

A. Warranty

1. The entire irrigation and water system shall be guaranteed to give satisfactory service for a period of one year from the date of acceptance by the OWNER.

2. Should any trouble develop within the time specified above due to inferior or faulty materials or workmanship, the trouble shall be corrected at no expense to the OWNER.

3. Any and all damages resulting from faulty materials or workmanship shall be repaired by the CONTRACTOR to the satisfaction of the OWNER, at no cost to the OWNER.
SECTION 02 2900 – LANDSCAPING

PART 1 - GENERAL

1.0 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General conditions, Supplementary Conditions, apply to work of this section.

1.1 DESCRIPTION

A. The work in this section includes landscape construction, protection of existing site and landscape conditions and landscape maintenance during construction.

B. See drawings for extent of landscaping.

1.2 RELATED WORK DESCRIBED ELSEWHERE

A. Section 01500 – Temporary Facilities and Controls
B. Section 02210 – Tree Protection
C. Section 31 1000 – Site Clearing
D. Section 02810 – Irrigation System
E. Section 02935 – Lawns and Grass

1.3 QUALITY ASSURANCE

A. Comply with applicable Federal, state and local regulations governing landscape materials and work.

B. Owner’s representative reserves right to review and reject materials at growing site and as delivered to site.

C. Observation at growing site does not preclude right of rejection at job site. Remove rejected materials from site immediately.

D. Personnel: Employ only qualified personnel familiar with required work.

E. Contractor’s Responsibilities: Landscape Contractor to coordinate activities with all other trades. Landscape Contractor to also secure utility locates prior to commencing work involving excavation or digging.

1.4 REFERENCED STANDARDS


D. Alex Shigo, Tree Pruning, Shigo & Tree Associates, LLC, 1989.


J. International Society of Arboriculture (ISA) Best Management Practices publications

1.5 SUBMITTALS

A. File Certificates of Inspection of plant material by Federal, State and local authorities with Landscape Architect, if required.

B. Submit within 30 days after award of contract, complete list of materials to be furnished under this section and confirmed sources for materials.

C. Requests for substitutions shall be submitted in writing to the Landscape Architect prior to award of contract.

D. Provide and pay for material testing. Submit the following materials certification and text report.

1. Topsoil
   
   a. pH factor
   
   b. Mechanical analysis
   
   c. Percentage of organic content
   
   d. Recommendations on type and quantity of additives required to establish satisfactory pH factor and supply of nutrients to bring topsoil to satisfactory level for planting.
   
   e. Identify source location of topsoil proposed for use on the project if imported from off-site.

2. Organic Additives
   
   a. Loss of weight by ignition
   
   b. Moisture absorption capacity
   
   c. Percentage of organic matter
d. pH factor

E. Submit the following material samples, in a size within reason to evaluate material thoroughly:

1. Mulch
2. Erosion control fabric
3. Edging

1.6 PRODUCT PREPARATION, DELIVERY, AND STORAGE

A. Preparation and Protection

1. Ball and Burlapped (B&B) Plants: Dig and prepare shipment in a manner that will not damage roots, branches, shape, and future development.

2. Container Grown Plants: Deliver plants in container sufficiently rigid to hold ball shape and protect root mass.

3. Use all means necessary to protect and maintain materials before, during and after installation and to protect the installed work and materials of all other trades.

4. All seed shall be delivered in the original bags certifying purity, germination, common, and botanical name for each species, and percent weed seed. Owner’s representative shall inspect all seed prior to application. Untagged seed bags shall be rejected. Immediately make all replacements necessary to the approval of the Owner’s representative and at no additional cost to the Owner.

5. Deliver all products, as specified, to site in original, sealed containers bearing manufacturer’s guaranteed statement of analysis.

B. Delivery

1. Deliver packaged materials in sealed containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery and while stored on site.

2. Deliver only plant materials that can be planted in one day unless adequate storage and watering facilities are available on job site.

3. Protect root balls by heeling in with mulch if not planted within 24 hours of delivery.

4. Protect during delivery to prevent damage to roots at all times. Cover all materials during transport.

5. Notify Land Owner’s representative of delivery schedule 48 hours in advance so plant material may be observed upon arrival at job site and can be inspected immediately after being unloaded at site.

6. Remove rejected plant material immediately from site.
7. Do not lift, move, adjust to plumb, or otherwise manipulate plants by trunk or stems. Avoid damage or stress by proper handling. Plant material dropped on the ground, rather than gently placed into the storage area or planting bed, will be rejected.

C. Storage

1. Plant material shall be stored in a shady and secure location, and shall be watered regularly prior to planting to prevent drying out of the rootball.

2. Seed, fertilizer, herbicide, hydromulch, and tackifier shall be kept in dry storage away from contaminants, at a weatherproof location.

1.7 JOB CONDITIONS

A. Site and Plant Protection

1. Care must be exercised to minimize disturbance or compaction of areas adjacent to any project. Trees shall be protected as specified in the project manual. (Section 02210 – Tree Protection)

2. In order to prevent excessive soil compaction and destruction of soil structure, no site work will be performed in cases where equipment or traffic must pass over wet soils or if wet soils must be handled or manipulated in order for the work to progress. Wet soil is defined as any soil within 90 percent of field capacity (saturation).

3. Do not move equipment over existing landscape or newly placed structures without approval of the Owner or Owner’s Representative.

4. Provide board roading as required to protect paving. Protect other improvements from damage, with protection boards, ramps and protective sheeting.

B. Planting Restrictions

1. Perform actual planting per referenced standards.

2. Owner’s representative must approve all bedding plants and ground covers.

4. Plant materials must be installed with spacings that allow, at maturity, a maximum of 30 percent canopy overlap or inter-fingering. This does not apply to species of widely disparate mature sizes, such as between a large tree and understory shrubs, because their canopies do not grow together.

5. Trees that are medium and small at maturity must be planted no closer than fifteen feet to any building, sidewalk or paved surface unless otherwise indicated on the drawings. Trees that are large at maturity cannot be placed closer than 20 feet to any building, sidewalk or paved surface unless otherwise indicated on the drawings. Owner must approve exceptions to these requirements.

C. Utilities

1. Utility locates are required prior to digging and any construction activities.
2. Coordinate work with Owner, including irrigation manager, in order to prevent damage to underground sprinkler system.

1.8 WARRANTY

A. Warranty plant material for one year after final acceptance. Replace dead or dying materials not in vigorous, thriving condition as soon as weather permits and on notification by Owner’s representative. Replace plants, including trees, which in opinion of Owner’s representative have partially died, thereby compromising shape, size or symmetry.

B. Replace plants with same kind and size as originally planted, at no cost to Owner. Provide one-year warranty on replacement plants. Trees should be replaced at start of next planting or digging season. In such cases, remove dead trees immediately. Protect irrigation system and other piping conduit or other work during replacement. Repair damage immediately.

C. Warranty excludes replacement of plants after final acceptance because of injury by storm, drought, drowning, hail, freeze, insects, or disease. Materials damaged by “Acts of God” prior to final acceptance are responsibility of Contractor.

D. At end of warranty period, remove staking and guying materials from the site.

1.9 MAINTENANCE

A. Water will be available on site. Provide necessary hoses and other watering equipment required to complete work.

B. Maintain plantings and trees by watering, cultivating, weeding, spraying, cleaning, and replacing as necessary to keep landscape in a vigorous, healthy condition.

C. Coordinate watering schedules with irrigation contractor or Owner’s representative during installation and until final acceptance. Provide deep root watering to newly installed trees.

D. Mowing: Mow newly planted grass area weekly after initial growth reaches two and one-half inches.

E. Weeding: Remove weeds and foreign grasses in planted areas at least once per week. Herbicides may be used only when approved by the Owner’s Representative.

F. Fencing: Provide four (4’) foot tall orange plastic snow fencing and metal tee fence post spaced at a maximum of eight (8’) feet apart around all walks at seeded areas. Maintain until lawn is accepted.

G. Tree Replacement

Trees removed during demolition or construction are to be replaced following consultation with Owner’s Arborist or Owner’s Representative. Appraised values of existing trees have been determined according to industry standards and will be provided by the Owner if applicable.

PART 2 – PRODUCTS

2.0 PLANTS

A. General
Plant quality must be equal to well formed No. 1 grade nursery stock. Listed plant heights are from tops of root balls to nominal tops of plants. Plants shall be specimen quality, typical of their species or variety.

B. Shrubs and Ground Covers

Plants shall be nursery grown, healthy and vigorous, of normal habit of growth for the species, free from disease, insect eggs, and larvae. Specified sizes are before pruning and measured with branches in normal position. Plants shall be well rooted and established in the container.

C. Ornamental and Shade Trees

Trees shall be healthy, vigorous, full-branched, well-shaped, trunk diameter, and height requirements as specified. Root balls shall be firm, neat and slightly tapered and well burlapped. Trees with loose or damaged root balls at time of planting shall be rejected. Root balls should meet the American Standard for Nursery Stock, Edition approved 1985 by American National Standards Institute, Inc. (Z60.1) standard.

D. Special Requirements

Shade trees are to be procured a minimum of 30 days prior to scheduled installations. Trees to be shipped in enclosed truck or the branches/leaves protected by appropriate fabric during shipping. Trees are to be healed in at job site or at Contractor’s holding facility and maintained until site is ready. Owner’s representative will review trees at holding area prior to planting.

E. Collected Trees

Direct planting from the collection site is preferred. Coordinate with Owner for utility locates and scheduling of sidewalk closures or other logistical issues. If necessary, spray field grown trees immediately prior to digging with anti-desiccant. Insure adequate coverage to trunks, branches and foliage.

2.1 SOIL PREPARATION MATERIALS

A. Soil Amendments: Soil amendments are not to be used unless approved by Owner.

B. Topsoil

1. Friable, fertile, dark, loamy soil, free of clay lumps, stones and other extraneous material and reasonably free of weeds and foreign grasses, with a pH of 5.0 to 8.0.

2. Organic matter shall be four to 12 percent total dry weight.

3. Provide tests for certification.

C. Sharp Sand

Sharp sand shall be clean, washed and fine aggregate and shall meet ASTM C33 standards.

D. Peat Moss
Peat moss shall be commercially produced, sterilized, reed-sedge peat, equivalent to Martins Peat, Big Fork, Montana. Peat must have a pH between five and seven and organic matter content not less than 90 percent.

E. Fertilizer

1. Type A – as recommended by testing agency.

2. Type B – Scotts’ “Osmocote” at a 14-14-14 ratio, incorporated into the soil according to instructions on the bag.

2.2 MISCELLANEOUS MATERIALS

A. Edging: Steel Edging: Standard commercial-steel edging, rolled edge, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.

Provide edging where indicated on the drawings to separate landscape materials.

Where edging is down grade of slope or crosses a swale, provide 1/2” diameter holes on down slope sections of edging, 30” on center, located at mid-height of edging.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Border Concepts Inc.
b. Collier Metal Specialties, Inc.
c. J.D. Russell Company

Edging Size: 3/16 inch (6.4 mm) wide by 6 inches (125 mm) deep

Stakes: Tapered steel, a minimum of 12 inches (300 mm) long.

Accessories: Standard tapered ends, corners, and splicers.

Finish: Galvanized Steel

B. Mulch

1. Shredded, medium grade, Douglas fir bark with a chip size of one and one-half inch to two and one-half inch average, free of wood chips and sawdust, as manufactured by Model Log Homes, 75777 Gallatin Road, Gallatin Gateway, Montana, 59730 (or approved equal).

2. One and one-half inch round, native, washed, river rock.

3. Owner’s representative approved equal.

C. Landscape Fabric
Heavy, professional grade, spun-bonded nylon landscape fabric with six-inch anchoring pins. Woven fabric is unacceptable.

Weed Barrier Fabric: A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. (101g/sq. m) minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally-encountered chemicals, alkalies, and acids. Water permeable and unaffected by U.V. light, freezing, and thawing.

D. Anti-Desiccant
1. Protective film emulsion for protection of plant surfaces during transport. Permeable to permit transpiration, as manufactured by Wilt Pruf, Inc., P.O. Box 4280, Greenwich, Connecticut, 06830. Mixed and applied in accordance with manufacturer’s instructions.
2. Owner’s representative approved equal.

E. Staking and Guying
1. Tie Wire: 12-gauge, galvanized wire
2. Metal posts: 8’-0” t-stakes
3. Nylon strap: three inches wide, 12 inches long white or black nylon strap with one ½” brass grommet in each end or Landscape Architect approved equivalent.

F. Drainage Fill
No drainage without Owner’s written permission.

G. Native Topsoil
Refer to Montana Standard Specifications Subsections 203.80 Topsoil Salvaging and placing, 610.00 Topsoiling and 713.06 Topsoil Material.

H. Imported Topsoil
In the event sufficient quantities of native topsoil cannot be salvaged from the site, the Contractor shall provide imported topsoil to supplement the project requirements. The Contractor shall provide topsoil that meets or exceeds the quality of the native topsoil material available on site. Contractor shall provide source and analysis information to the Owner’s Representative, for his approval, prior to delivery. The Contractor shall incorporate into the topsoil, amendments necessary to provide topsoil fertility and quality, equal to or exceeding the characteristics of the native topsoil.

PART 3 - EXECUTION

3.0 INSPECTION
Examine sub-grade and verify conditions under which work is to be performed. Notify General Contractor and Owner’s representative of unsatisfactory conditions.
3.1 BED PREPARATION

A. Scarify all sub-grade of bed areas to six inches, all areas.

B. Contractor shall spread topsoil evenly throughout bed after thoroughly mixing soil, amendments and fertilizer together on site.

C. Remove any debris and rocks larger than one inch.

3.2 SHRUB AND GROUNDCOVER PLANTING

A. Provide one-foot deep top soil in all shrub beds.

B. Place plants in a position on bed areas before removal from containers. Obtain approval from Owner’s representative of plant layout in the field. Owner’s representative reserves the right to shift locations of plants prior to planting.

C. Remove all materials (burlap, twine, wire, etc.) from entire root ball on all B&B plants.

D. Plant all plants as located, setting plants with the root flare even with the tops of bed grades. Backfill with native soil and compact soil carefully around each plant ball. Water thoroughly to eliminate air pockets. Carefully prune plants to remove dead or broken branches and hand-rake bed areas to smooth even surfaces.

3.3 TREE PLANTING

A. Ornamental Trees and Shrubs

1. Stake locations for approval by Owner’s representative.

2. Plant in pits two times wider than ball for trees and shrubs.

3. Fill material should be the native soil removed from the hole. No planting mix or soil amendments should be used.

4. Glazed sides of mechanically dug holes should be roughened or scarified to allow root penetration.

5. Remove all materials (burlap, twine, wire, etc) from entire root ball.

6. Carefully settle by watering to prevent pockets.

7. Root collar shall not be planted below finish grade level.

B. Root Balls

1. Root balls shall be properly located in relationship to adjacent soil as required by referenced standards.

2. Balls set too deep or too shallow shall be carefully removed and replanted as required by the Owner’s representative.

3.4 TREE MOVING AND TRANSPLANTING
A. Tree moving and transplanting shall be done in accordance with standards outlined in ANSI A300: Standards for Tree Care Operations, American National Standards Institute.

B. All tree moving and/or transplanting operations shall be coordinated with the Owner prior to commencement of work.

C. All removal and receiving areas shall have a comprehensive utility locate done according to current standards prior to commencement of work.

### 3.5 PERENNIAL PLANTING

A. Prepare planting beds as indicated on drawings. Provide one foot of thoroughly mixed and prepared soil consisting of 50 percent sand loam topsoil; 25 percent coarse pumice, 3/8 inch size; and 25 percent peat moss. Thoroughly mix in 20 pounds of Scott, Ortho or Lilly-Miller nitrogen fertilizer per cubic yard with formulation of 10-20-10.

B. Replace existing soil with planting mix.

C. Space plants as indicated on drawings. Obtain approval of plant layout from Owner’s representative before planting. Owner’s representative reserves the right to change the location of plants prior to planting.

### 3.6 LANDSCAPE FABRIC

After planting has been completed and approved by the Owner’s representative, install landscape fabric across planting beds. Sheets of fabric should have a minimum six-inch overlap. At the bed margins, fabric should be installed under the bottom of the edging. Fabric lapping outside the edging should be trimmed to below grade and buried when the edging is backfilled. Fabric should be well anchored with 6 inch staples pounded flush with the grade. Plant openings must be large enough to allow for future growth.

### 3.7 TOP DRESSING

After landscape fabric has been installed and accepted by the Owner’s representative, top dress bed areas with mulch, as indicated on drawings, a minimum of three inches deep. Fabric must not be exposed or protrude above the mulch or edging. Mulch should be clean, whether organic or mineral mulch, and should be free of debris and soil.

### 3.8 TREE WRAPPING

Tree wrapping will not be accepted.

### 3.9 PRUNING OF NEW TREES

A. Follow referenced standards and prune material as directed by Owner’s representative.

B. Do not cut back terminal branches. Properly remove sucker growth from the base and badly broken or bruised branches. Thin native trees more heavily than nursery grown plants.

### 3.10 TREE SAUCERS

Form a four inch high saucer around each new tree for deep watering. Contractor is responsible for deep watering until final acceptance.
3.11 TREE GUYING AND STAKING

A. Stake and guy trees immediately following planting operation. Take precautions during guying operation to prevent damage or injury to branches and roots. Orient all stakes within each cluster or row of trees in the same direction or as directed by Owner's representative.

B. Trees of over one inch caliper must be staked with woven nylon straps and wire. Tension on ties should be adequate to support tree, but slack enough to permit movement and the development of reaction wood. Ties cannot be fastened tightly to trunks; free movement or slack equal to at least twice the caliper must be allowed.

3.12 PLANTING BED EDGING

Install edging per manufacturer's directions. Set edging as indicated in true lines as designed with top of edging one inch above finish grade.

3.13 CLEANUP

A. Keep premises neat and orderly including organization of storage areas. Remove trash and debris from excavated planting areas, preparing beds, or planting plants from site daily as work progresses. Keep paved areas clean by sweeping or hosing.

B. Repair all damage caused by landscape operations.

END OF SECTION 02 2900
SECTION 02 2935 – LAWNS AND GRASS

PART 1 - GENERAL

1.0 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General conditions, Supplementary Conditions, apply to work of this section.

1.1 DESCRIPTION

A. Work in this section includes:
   1. Furnishing all plants, labor, equipment;
   2. Performing all operations to finish grade topsoil;
   3. Prepare seed and sod beds;
   4. Sod all lawn areas; and
   5. Maintenance and protection of all sodded and seeded areas.

B. All areas within the contract limits, except surfaces occupied by paving and areas indicated to be undisturbed shall be hydroseeded or sodded as shown on Plans. Areas repaired due to Contractor damage shall be hydroseeded.

1.2 RELATED WORK DESCRIBED ELSEWHERE

C. Section 02810 - Irrigation System

D. Section 02900 - Landscaping

The Montana Department of Transportation Standard Specification for road and bridge construction, 1987 Edition, Section 610, roadside development shall govern the work as if bound herein. Where provisions of this section and the referenced standard conflict, this section shall govern.

1.3 QUALITY ASSURANCE

A. Qualification of Workmen

Provide at least one person 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 materials being installed and the best methods for their installation and who shall direct all work performed under this section.

B. Contractor Qualifications

The Contractor shall have at least two (2) years of weed control spraying experience. Proof of experience will be required. The Contractor must have a valid Montana Commercial Herbicide Applicator’s License.

C. Chemical Registration

All weed control chemicals must be registered with the Environmental Protection Agency and the State of Montana.

D. Equipment Requirements
The Contractor shall furnish, operate, and maintain suitable and adequate equipment necessary to perform the above operations in an approved and workman-like manner without delays. Spray nozzles shall be raindrop or similar drift control type.

E. Liability and Contractor’s Responsibilities

Weather conditions must be such that no damage outside the sprayed area will occur and the Contractor will cease spraying whenever the application of spray could cause such damage.

The Contractor agrees to hold harmless the Owner and Landscape Architect and/or Engineer against any and all claims for damage arising from operations covered in this proposal.

F. Time of Application

Because of varied climatic conditions, it will be the Contractor’s responsibility to coordinate spraying activities to achieve the best results. To avoid possible chemical exposure and general alarm among campus users, time of application must not coincide with other nearby outside campus activities. If nearby activity encroaches during spraying operations, spraying must cease immediately until people leave the area.

1.4 PRODUCT HANDLING

A. Protection

1. Use all means necessary to protect and maintain materials before, during, and after installation and to protect the installed work and materials of all other trades.

2. All seed shall be delivered in the original bags certifying purity, germination, common, and botanical name for each species, and percent weed seed. Owner shall inspect all seed prior to application. Untagged seed bags shall be rejected. Immediately make all replacements necessary to the approval of the Owner’s Representative and at no additional cost to the Owner.

3. Deliver chemical fertilizers and herbicides, as specified, to site in original, sealed containers bearing manufacturer’s guaranteed statement of analysis.

B. Storage

Seed, fertilizer, herbicide, hydromulch, and tackifier shall be kept in dry storage away from contaminants, at a weatherproof location.

C. Notice to Proceed

The Contractor shall not proceed with seeding or sodding operations until the irrigation system has been tested and approved by the Owner’s Representative.

D. Schedules

Install lawn seed mixes during the specified time periods. If special conditions exist that may warrant a variance in the specified plant dates or conditions, a written request shall be submitted to the Owner’s Representative stating the special conditions and proposed variance.
The Contractor shall provide a weed control plan and schedule prior to bed preparation, for approval of the Owner’s Representative.

E. Substitutions: Requests for substitutions shall be submitted in writing to the Owner’s Representative prior to award of contract.

1.5 SPECIAL LANDSCAPE PROVISIONS

A. Water: Water will be available on site. Provide necessary hoses and other watering equipment required to complete work.

B. Maintenance

   i. Until final acceptance, and until as approved stand of grass is achieved, maintain plantings by watering, cultivating, mowing, weeding, spraying, cleaning and replacing as necessary to keep lawns in a vigorous, healthy condition.

   ii. Watering: Water as necessary to keep top two inches of soil moist. Coordinate with Irrigation Contractor.

   iii. Mowing: Mow newly planted grass area weekly after initial growth reaches 2-½ inches.

   iv. Weeding: Remove weeds and foreign grasses in planted areas at least once per week. Herbicides may be used only when approved by the Owner’s Representative.

   v. Fencing: Provide four (4’) foot tall orange plastic snow fencing and metal tee fence post spaced at a maximum of eight (8’) feet apart around all walks at seeded and sodded areas. Maintain until lawn is accepted.

1.6 CONDITION OF SURFACES

Lawn areas will be left at ± 0.1 feet of finish grade as shown on plans.

1.7 ACCEPTANCE

The work will be accepted when a completed stand of grass at the three-leaf stage or beyond is achieved and all provisions of Section 3.5.C, “Performance” have been met as approved by the Owner and Owner’s Representative.

PART 2 - MATERIALS

2.1 GRASS SEED

A. General

   1. Seed shall be used only in areas where an irrigation system is absent or has been removed.

   2. All seed shall be:

      a. Free from noxious weed seeds, and re-cleaned;
b. Grade A recent crop seed;
c. Treated with appropriate fungicide;
d. Delivered to the site in sealed containers with dealer's guaranteed analysis.

B. Irrigated Grass Seed Mixture: Seed at the minimum rate of three (3) pounds per one thousand (1000) square feet (130 lbs./acre).

<table>
<thead>
<tr>
<th>Name of Grass</th>
<th>Proportion by Weight</th>
<th>Percent Purity</th>
<th>Percent Germination</th>
</tr>
</thead>
<tbody>
<tr>
<td>'Midnight' Kentucky bluegrass</td>
<td>25%</td>
<td>95%</td>
<td>85%</td>
</tr>
<tr>
<td>'Rugby II' Kentucky bluegrass</td>
<td>25%</td>
<td>95%</td>
<td>85%</td>
</tr>
<tr>
<td>'Ram I' Kentucky bluegrass</td>
<td>25%</td>
<td>95%</td>
<td>85%</td>
</tr>
<tr>
<td>'Delaware' Dwarf Peren. Rye Grass</td>
<td>25%</td>
<td>95%</td>
<td>85%</td>
</tr>
</tbody>
</table>

C. Non-irrigated Grass Seed Mixture: must be 'Kitty Hawk' turf-type tall fescue seeded at three (3) pounds per thousand (1000) square feet (130 lbs./acre).

2.2 SOD

A. General

1. Sod all areas where site is substantially disturbed.

2. Sod shall be from a commercial sod farm located in the Gallatin Valley.

3. Sod type, condition and source shall be approved by the Owner's Representative.

B. Sod Characteristics

Sod shall be well-established lawn turf grasses similar to the seed mix described in 2.1 B.

Sod shall be vigorous, well-rooted, healthy turf, well hydrated and possessing excellent color.

Sod shall be free from disease, insect pests, weeds, other grasses, stones, and any other harmful or deleterious matter.

C. Sod Handling

Cut sod in uniformly wide strips, uniformly 1-1/2 inches thick with clean cut edges.

Sod shall be rolled or folded prior to lifting. Handling of sod shall be done in a manner that will prevent tearing, breaking, drying, or any other damage.

Sod shall be installed in place on the site not more than 24 hours after cutting.

2.3 FERTILIZER

A. Soil Testing
1. Verify fertilization needs by sampling and testing soil prior to purchasing fertilizer. The test sample shall be obtained by sampling six different locations at the project site. Soil from sampled locations shall be mixed in equal parts to provide a compiled sample for testing.

Testing by an approved laboratory shall include:

a. A test for soil pH,

b. A test for electrical conductivity (EC),

c. A test for the amount of nitrogen, phosphorus and potassium present (NPK),

d. A test to determine the amount of organic matter present (OM).

2. Results of tests shall be reviewed by the Owner and Engineer prior to purchase of fertilizer. If test results are typical for the general campus area, fertilization operations may commence as specified. If test results are not typical for the general campus area, Owner will provide modified formulation and application rate specifications by Change Order.

B. Formulation

1. Fertilizer shall be manufactured by Anderson ProTurf, or equal approved by the Owner. Application rates shall be in accordance with manufacturer recommendations. Fertilizer shall be complete, uniform in composition, dry and free flowing. The fertilizer shall be delivered to the site in the original waterproof containers, each bearing the manufacturer's statement of analysis.

2. Fertilizer to be spread on areas to be seeded shall be commercially prepared by Anderson ProTurf or an equal product pre-approved by the Owner. Fertilizer shall be a slow release, Poly-S urea, and shall contain the following percentages by weight:

   10% Nitrogen  
   20% Phosphorus  
   10% Potassium  
   12% Sulfur

3. Grow - in Fertilizer shall be a slow-release, Poly-S urea, and shall be formulated as 25-3-4-Fe-2% and commercially prepared by Anderson ProTurf or equal approved by the Owner.

C. Special Protection

If stored at the site, protect fertilizer from the elements at all times.

2.4 Mulch

Wood cellulose fiber for hydromulch – Weyerhauser, Conweb, or approved equal.

2.5 Mulch Tackifier

Mulch tackifier must be natural, non-asphaltic, vegetable gum with gelling and hardening agents, Terra Tack or approved equal.
2.6 Water

Water shall be clean irrigation quality water.

2.7 Pre-Planting Herbicide

Roundup, provide compatible surfactant and drift control agents as required.

2.8 Post-Emergent Herbicide

TRIMEC" 2.4.D.M.C.P.P. DICAMBA (BANVIL) manufactured by P.B.I. Gordon 816-421-4070 distributed by Wilbur Ellis Company (406)-248-1176 or West Chemical Agricultural Chemicals, Inc., (406)-252-3834, or other appropriate control which best fits the weed problem and necessary applications.

2.9 Native Topsoil

Refer to Montana Standard Specifications Subsections 203.80 Topsoil Salvaging and placing, 610.00 Topsoiling and 713.06 Topsoil Material.

2.10 Imported Topsoil

In the event sufficient quantities of native topsoil cannot be salvaged from the site, the Contractor shall provide imported topsoil to supplement the project requirements. The Contractor shall provide topsoil that meets or exceeds the quality of the native topsoil material available on site. Contractor shall provide source and analysis information to the Owner’s Representative, for his approval, prior to delivery. The Contractor shall incorporate into the topsoil, amendments necessary to provide topsoil fertility and quality, equal to or exceeding the characteristics of the native topsoil.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection

Prior to all 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.

Verify that seeding may be completed in accordance with the original design and the reference standards.

B. Discrepancies

1. In case of discrepancy, immediately notify the Owner’s Representative.

2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.2 FINISHING

A. Topsoil Spreading
Contractor shall provide a 6” minimum compacted, depth of topsoil on all lawn areas. Topsoil shall be graded smoothly and evenly. Lawn area subgrade particularly on slopes shall be roughed and scarified 6” minimum depth to except and bind with the finish layer of topsoil. Topsoil shall be spread in a non-muddy, unfrozen condition. Surface finish shall be +/- 0.1 foot. Compaction of the topsoil layer shall be ±85% maximum dry density. Refer to Montana Department of Highways Standard Specifications Subsections 610.00 Topsoiling.203.08 Topsoil Salvaging and Placing, 713.06 topsoil material.

B. Finish Grading

Grade lawn areas to finish grades, filling as needed or removing surplus dirt and floating areas to a smooth uniform grade. All lawn areas shall slope to drain minimum 2% slope. Where no grades are shown, surfaces shall have a smooth and continual grade between existing or fixed controls (such as walks, curbs, catch basins, and elevations at steps or building). Loosen and fine rake areas to receive seed or sod to break up lumps and produce a smooth, even grade, free from unsightly variations, ridges, or depressions. Remove stones one inch or larger, sticks, roots or other debris exposed during this operation. All finish grades shall meet the approval of the Owner’s Representative before grass seed is sown or sod is placed.

C. Weed Control

1. Prior to application of seed or sod, the bed shall be roughed up to a depth of 1/8th inch.

2. Moisten the seedbed to a depth of 1” to promote germination of any seeds contained in the topsoil. If rhizomatous grasses, field bindweed (morning glory) or noxious weeds are evident, the Contractor shall be required to eliminate those undesirable plants prior to seeding or sodding, at the discretion and direction of the Owner’s Representative.

3. Spray areas showing weed growth with approved herbicides, mow, and remove clippings prior to final grading. Seeding and sodding shall be executed 72 hours following Roundup application.

3.3 PLANTING

A. Preparation

1. Hydroseed bed preparation shall pertain to the preparation of the surface of the ground to receive the seed. The ground shall be hand or machine raked to remove all debris, clods, rocks, and other material larger than 1 inch, to a depth of 4 inches. Such debris, clods, rocks, and other material so removed shall be disposed of off the immediate property. Hydroseed bed preparation shall not commence until the moisture conditions make the ground area and soil friable.

2. If there has been a time lapse following the placement of the topsoil to allow it to become settled and compacted on the surface, the areas to be seeded shall be thoroughly worked to a depth of 3 to 4 inches so as to provide a surface of such condition that it will allow application of the seed in compliance with these specifications.

3. Hydroseed beds shall be permitted to settle or firmed by rolling before seeding.
4. Initial application of fertilizer shall be applied evenly at the rate of 600 lbs. of material per Acre prior to seeding and incorporate into the prepared seedbed ½” deep by light raking.

B. Sowing

1. Immediately prior to the application of the seed, the soil shall be loose to a depth of at least 1 inch and free from all material as specified. If soil is too loose or dry for good handling, it should be moistened and rolled lightly.

2. Hydroseed all irrigated areas as shown on the plans. Irrigated areas may be seeded any time between April 15 and June 1, and August 10 and September 10, provided the irrigation system is operational. Hydroseed all dry land areas as shown on the plans. Seed to overlap limits of irrigated lawn by one half the distance between sprinkler head and limits of coverage between April 1 and May 15, and September 20 and October 30.

3. Lawn grass shall be sown at 3 pounds per 1000 square feet, (130 lbs./acre) using approved methods that allow for the even precise hydroseeding and incorporation of the seed into the top ½-inch of the prepared seedbed. If seed can be drilled, reduce rate to 60 pounds per acre. A drill type seeder with spacing greater that 3½” is not acceptable. When seed is drilled and the surface is unduly loose, the seedbed shall be compacted by an agricultural roller, cultipacker, or compactor not more than 24 hours after seeding.

4. Apply tackifier on all slopes greater than 4 to 1 at a rate of 100 pounds per acre.

5. Seed and mulch shall be applied in separate and distinct operations except that a minimal amount of mulch may be added to the seed slurry as a visual aid during the seeding process. Mulch applied with seed shall not exceed of mulch for each five (5) gallons of water. This mulch shall be deducted from the total quantity to be applied. The application of the seed slurry shall be made with the equipment having a built-in agitation system and operating capacity sufficient to agitate, suspend, and homogeneously mix slurry containing water, seed, and mulch. The slurry shall be sprayed over the soil in a uniform coat. Wherever practical, the slurry shall be applied normal to the surface being treated to effectively drill the seed in to the seedbed. Hydromulch application shall follow seeding as soon as practical, with consideration for minimal soil erosion through washing. All seeded areas shall be mulched before work is terminated on any day.

C. Mulching

1. Mulch all hydroseeded areas. Topsoil or seed that washes out for reasons attributable to the Contractor’s activities or failure to take proper precautions shall be replaced at the Contractor’s expense.

2. All structures shall be protected from hydraulic application of mulch material. Any material deposited on walks, streets, inlets, or other structures, shall be removed.

1. Mulch shall not be applied in the presence of free surface water, but may be applied on damp ground.
2. Organic mulch shall be mixed with water at a rate of one pound of mulch (dry weight) to one gallon of water, hydraulically applied as per manufacturer’s recommendations at a rate of 2000 pounds per acre.

D. Tackifier

Mulch tackifiers shall be mixed with water at a rate specifically by the manufacturer and shall be applied at a minimum rate of 40 pounds per acre.

3.4 SOD INSTALLATION

A. Preparation

Bed preparation shall be similar to that required for seedbed preparation.

B. Application

1. Sod may be placed at any time when the ground is not frozen.

2. A string or line of boards may be used as a guide for setting the first course of sod across the area. Each course is matched against the edge of this course, staggering successive courses. All work should be done on boards laid on top of the sod to avoid footprints or other injuries to the surface.

3. All sod is to be laid on topsoiled areas. The joints shall be butting.

4. Lay sod across slope.

5. Roll or lightly tamp, with suitable wooden or metal tamper, all new sod sufficiently to set or press sod into underlying soil.

6. Before sod is laid, apply fertilizer specified, at the rate of six (6) pounds per 1000 square feet.

7. After sod installation is completed, clean up and thoroughly moisten areas of newly laid sod.

3.5 STAKING AND FENCING

A. General

All newly sodded or seeded areas are to be fenced so as to prevent trampling by foot or vehicular traffic. Fencing shall be removed by Contractor when Owner has determined that the lawn area is successfully established, as dictated in this section.

B. Materials

1. Posts to be five-foot minimum, six foot maximum green steel t-posts.

2. Fencing to be four-foot Tenax in guardian orange, length variable. Color substitutions allowed only with the direction and approval of the Project Manager.

C. Performance
1. Staking shall not be performed without prior identification of underground utilities, including but not limited to irrigation.

2. Stakes shall be installed every 16 feet or less, using a t-post driver.

3. Fencing to be attached to posts with nylon fence ties, zip ties or flexible wire.

3.6 MAINTENANCE

A. General

Maintain original grades of all lawn areas after commencement of planting and during maintenance period until final acceptance of the job, but in no case less than forty-five (45) days.

B. Work Included

1. All irrigated areas shall be watered as required to establish a mature stand of grass.

2. All areas shall be watched closely so that they are not permitted to dry out or to form puddles of water, or to be washed by over-application.

3. Mow all seeded lawn at 2½" each time its height reaches 3½". Maintain through a minimum of three mowings to provide an even stand over the entire seeded area, until final inspection and acceptance.

4. Provide a "grow-in" fertilizer, as specified, for all irrigated lawns. Apply six weeks after seed germination. In the case of fall seeding, apply prior to May 1, the following year.

5. Apply post emergence herbicide per the manufacturer's recommendations and application rates, whenever and wherever weed growth jeopardizes or inhibits the development of a mature grass lawn. Apply herbicide in late spring or early summer. Apply only when mean high temperatures are between 60° and 85° F with wind velocities less than five (5) miles per hour. Prior to application, Contractor shall notify Owner, in writing, of the proposed schedule for applying herbicides. Written notice shall include the following items:

   a. Date of proposed application
   b. Specific area of proposed application
   c. Proposed herbicide for application
   d. Proposed concentration and application rate.

The application area must be signed with Owner-approved signs informing the public of the application and duration of restricted use.

C. Performance

1. Establish a dense lawn of permanent grasses, free from lumps and depressions. Any part failing to show uniform cover and grades free from lumps and depressions shall be redone, and such replacement shall continue until a dense lawn is established. Scattered bare spots will not be allowed. Adequate germination shall equate to 11 to 15 seedlings per square foot over 95 percent of area seeded for native grass areas.
2. Finish grades at the edges of sidewalks, curbs or other hard surface boundaries must be at a level such that the established turf surface will be one (1) inch below the plane of the hard surface for a minimum distance of six (6) feet from the edge.

3. Maintain entire lawn area until the above performance is achieved throughout the project.

D. Replacements

1. Any area that fails to produce an adequate stand of grass shall be re-sodded or reseeded by the Contractor at no additional expense to the Owner.

2. Replacements required because of vandalism or other causes beyond the control of the Contractor are not part of the Contract.

3. For acceptance, the established grass will be judged by the stand's fullness, health, maturity and number of weeds present. Determination and acceptance of grass areas shall be made by the Owner's Representative.

E. Extension of Maintenance Period

Continue the maintenance period at no additional cost to the Owner until all previously noted deficiencies have been corrected, at which time the final inspection shall be made.

3.7 CLEAN-UP

Keep premises neat and orderly including organization of storage areas. Remove trash and debris resulting from lawn preparation from site daily as work progresses. Leave paved areas in a broom clean condition by sweeping or hosing.

END OF SECTION 02 2935
SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Drawings and General Provisions of the Contract, Including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

B. ACI Publications as listed throughout. The Contractor must have a current copy of ACI SP-15 (05) "Field Reference Manual" for concrete construction on site.

C. Concrete for composite floor construction.

D. Structural reinforced concrete foundations, walls and columns.

1.02 SUMMARY

A. This section specifies cast-in-place concrete footings, foundations, and walls including formwork, reinforcement, concrete materials, mix design, placement procedures, finishes and curing.

1.03 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans.

B. Embedded Items: Items other than reinforcement placed in the concrete pertaining to anchorages or connections such as anchor rods, embedment plates, and the like.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: For each type of manufactured materials and product required.

C. Design Mixes: Concrete Mix Design for each concrete mix. Include alternate mix designs when characteristics of materials, product conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mix water to be withheld for later addition at project site.

D. Steel Reinforcement Placing Drawings: Details of fabrication, bending, and field placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement". Include material grade, sizes, quantities, spacing, splice locations and laps, bending diagrams, arrangement, mechanical couplers, and supports of concrete reinforcement.

1. Include elevation view(s) of grade beams.

E. Control Survey: Prepared by or under the supervision of the Contractor. Verify plan location and elevation of grid control for concrete construction and all concrete embedments before concrete placement. Survey and report are the Contractor's responsibility.

F. Concrete Delivery Tickets: Submit upon request.

G. Material Certificates and/or Test Reports: Signed by manufacturers or qualified testing agency certifying that each of the following items complies with requirements:

1. Concrete Mix Design.
2. Steel Reinforcement and reinforcement accessories.
3. Curing materials and agents.
4. Waterstops
5. Bonding agents.

H. LEED Submittal:

1. Product Data for Credit MR4.1 and MR 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.

a. Include statement indicating costs for each product having recycled content.
2. Design Mixtures for Credit ID1.1: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements and for equivalent concrete mixtures that do not contain portland cement replacements.

I. Minutes of Pre-Installation Meeting.

J. Sustainable Design Submittal: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used; use LEED New Product Content Form.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An experienced and qualified installer who has completed concrete work similar in material, design and extent to that indicated for this project and whose work has resulted in construction with a record of successful in-service performance. A qualified installer who employs, on project, personnel qualified as ACI-Certified Flatwork Technician and Finisher and a supervisor who is ACI-Certified Concrete Flatwork Technician.

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

1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated; as documented according to ASTM E 548.

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

2. Personnel performing laboratory tests shall be ACI Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade 1. Testing Agency Laboratory supervisor shall be an ACI Concrete Laboratory Testing Technician - Grade II.

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

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

F. Quality Control and Construction Tolerances: Comply with the information presented in the following publications, unless more stringent provisions are indicated:

1. ACI 301, "Specification for Structural Concrete".
2. ACI 117, "Specification for Tolerances for Concrete Construction and Materials".
3. Control Survey: Verify plan location and elevation of all embedments before concrete placement (see submitted section).

G. Concrete Laboratory: Engage in a qualified independent agency to perform material, evaluation tests and to design concrete mixes.

H. Pre-Installation Conference: Conduct conference at project site to comply with requirements in Division 1 Section "Project Management and Coordination".

1. Before concrete work begins, review concrete design mixture and examine procedures for ensuring quality of concrete materials and construction. Review subgrade approval, placement operations, testing, consolidations, construction joints and curing.

2. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
   a. Contractor's Superintendent
   b. Independent Testing Agency
   c. Ready-Mix Concrete Manufacturer
   d. Concrete Sub-Contractor
1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle reinforcement to keep clean (completely free of mud and oils) and prevent bending.

PART 2 PRODUCTS

2.01 FORM-FACING MATERIALS

A. Smooth Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practical sizes to minimize of joints.
   1. Metal or other approved panel materials.
   2. Exterior grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
      a. Structural 1, B-B, or better, mill oiled and edge sealed.

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

C. Pan-Type Forms: Glass-Fiber-Reinforced Plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

D. Chamfer or Rustication Strips: Wood, metal, PVC, or rubber strips, size as detailed.

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

F. Form Ties - Non-Exposed Concrete: Factory-Fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of the exposed concrete surface.
   2. Furnish ties that, when removed, will leave holes not larger than 1 inch in diameter in concrete surface.
   3. Furnish ties with integral water-barrier plates in walls indicated to receive waterproofing.

G. Form Ties - Exposed Concrete (as indicated): Factory-Fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties with re-usable plastic CONES, designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
   1. Caulk all panel joints smooth at all form panel abutments.
   2. Layout forms for consistent even spacing of ties to create vertical and horizontal alignment of cones.
   3. Cones to be 1" to 1 1/4" wide and 1" to 1 1/2" deep. Do not fill cone holes.

2.02 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Provide products with an average recycle content of steel products so post-consumer recycled content plus one-half of post-consumer recycled content is not less than 25 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

C. Low Alloy Steel Reinforcing Bars (Deformed Bars): ASTM A 706/A 706M, deformed. Use when welding is indicated.

D. Plain Steel Wire: ASTM A 82, as drawn.

2.03 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers and other devices for spacing, supporting and fastening, reinforcing bars. Manufacturer bar supports according to CRS's "Manual of Standard Practice" from steel wire or plastic as follows:
2.04 CONCRETE MATERIALS
A. Portland Cement: ASTM C 150, Type I/II.
B. Fly Ash: ASTM C 618 except loss on ignition less than 1.0 percent and calcium oxide content less than 30 percent (Class F preferred if available).
C. Normal Weight Aggregate: ASTM C 33, uniformly graded as follows:
   1. Class: Severe weathering region, Class 3S for all aggregate.
   2. Nominal Maximum Course Aggregate Size: 3/4 inch for elevated slabs, 1 inch for all other concrete applications.
   3. Fine Aggregate (Sand): Free of materials with deleterious reactivity to alkali in cement.
D. Water: potable and complying with ASTM C 260.

2.05 ADMIXTURES
A. Chemical Admixtures: Provide admixtures certified by manufacturer to contain less than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
C. Water reducing Admixture: ASTM C 494, Type A.
D. Water Reducing and Set Retarding Admixture: ASTM C 494, Type D.
E. Water reducing and Set Accelerating Admixture: ASTM C 494, Type E.
F. Color Pigment: ASTM C 979, synthetic mineral oxide pigments that are non fading and resistant to lime and other alkalis.
   1. Color: As specified by Architect from supplier full range.

2.06 FIBER REINFORCEMENT
A. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in concrete complying with ASTM C 116, Type III, 3/4 to 1/2 inches long.

2.07 WATERSTOPS
A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers for adhesive bonding to concrete.
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the following:
      a. Volclay Waterstop-RX; Colloid Environmental Technologies Co.
      b. Conceal CS-231; Concrete Sealants Inc.
      c. Swellstop; Greensreak.

2.08 CURING MATERIALS
A. Moisture Retaining Cover: ASTM C 171, polyethylene film on white burlap-polyethylene sheet.
B. Clean Water Borne, Membrane Forming Curing Compound: ASTM C 309; Type 1, Class B, 18 to 25 percent solids, non dissipating.
C. Water: Potable.

2.09 RELATED MATERIALS
A. Bonding Agent; ASTM C 1059, Type II, non-dispersible, acrylic emulsion or styrene butadiene.
B. Epoxy Bonding Adhesive: ASTM C 881, two component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
   1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardness concrete.
2.10 REPAIR MATERIALS

A. Patching Mortar - Polymer modified cementitious mortar.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Poly-Patch, by Euclid Chemical Co.
      b. Sikatop 122; by Sitka Chemical Co.
      c. EMACO R310, by Master Builders.

B. Repair Mortar: A system for overlay and patching of concrete subject to wheel traffic or moderate chemical exposure.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Emaco R310, by Master builders inc.
      b. Euco # 456S Mortar, by Euclid Chemical Co.

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

D. Epoxy Injection: Two-component low-viscosity epoxy adhesive for pressure injection grouting.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. SCB Conressive Series, by Masterbuilders, Inc.
      b. Eucopoxy Injection Resin, by Euclid Chemical Co.

E. General: Applicable for use on floor slabs covered by flooring materials only.

F. Repair Underlayment (Beneath Floor Covering): Cement-based, polymer-modified, self-leveling product that can be applied in thickness from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, sashed gravel, 1/8 to 1/4 inch of coarse sand as recommended by underlayment manufacturer.
   4. Compressive Strength: Not less than 4000 psi in 28 days when tested according to ASTM C 109/C 109M.

G. Repair Overlay: Cement-based, polymer-modified, self-leveling product that can be applied in thickness from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150, Portland cement or hydraulic or blended hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
   4. Compressive Strength: Not less than 4000 psi at 28 days when tested in according to ASTM C 109/C 109M.

H. Repair Topping: Self-leveling, polymer-modified high strength topping.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Thin-Top Patch, by Euclid Chemical Co.
      b. Topping 112, by Master Builders, Inc.

2.11 CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete proportioned by either laboratory trial mix or field test data or both:
   1. Proportion normal-weight concrete according to ACI 301.
   2. Use a qualified independent testing agency for preparing and reporting proposed mix designs for laboratory trial mixes.
B. Foundation Walls, Foundation Pilasters, Piers, Pile Caps, Grade Beams and Concrete Walls. Proportion normal weight concrete mix to comply with key perimeters as follows:
   1. As indicated in drawings.

C. Footings Cast on Grade (Use Class A at Contractor's Option): Proportion normal weight concrete mix to comply with key parameters as follows:
   1. As indicated in drawings.

D. Interior-Slab-On-Grade and Elevated Slabs: Proportion normal weight concrete mix to comply with key parameters as follows:
   1. As indicated in drawings.

E. Matt Foundations: Proportion normal weight concrete mix to comply with key parameters as follows:
   1. As indicated in drawings.

F. Cementitious Material: Include percentage, by weight, of cementitious materials other than Portland cement in concrete as follows except that the minimum content may be waived for cold weather placement:
   1. Fly Ash: 10 percent minimum, 40 percent maximum.

G. Air Content: Add air entraining admixtures at manufacturer's prescribed rate to result in concrete at point of placement having and air content as described within tolerance of plus 1.5 or minus 1.0 percent.

H. Limit Water Soluble, chlorine-ion content in hardened concrete to 0.15 percent by weight of cement.

I. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use Water-Reducing Admixture in concrete for placement and durability.
   2. Use Water-Reducing Admixture when required by high temperatures, low humidity or other adverse placement conditions.
   3. Use set retarding admixture in drilled pier content when temporary casing is withdrawn.

2.12 ADJUSTMENT TO CONCRETE MIXES

A. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.

B. Mix design adjustments may be requested by the contractor when characteristics of materials, use of admixture, job conditions, methods of placement, weather, test results, or other circumstances warrant such adjustments provided, there are no additional costs to the Owner and adjustments are accepted by the Engineer.

C. If, during the progress of work, the contractor desires to use materials other than those approved originally, or if materials from the source originally approved change in characteristics, additional tests shall be made with new materials which will produce concrete meeting specified requirements.
   1. These additional tests shall be made by the Testing Agency, at the expense of the Contractor. No concrete made from such different materials shall be used in the work until approved by Engineer.

D. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being furnished by the vendor, the Engineer may order such changes in the proportions or materials, or both, as may be necessary to secure the desired properties, subject to the specified requirements. Any changes ordered shall be made at the Contractor's expense - no extra compensation will be allowed for such changes.

2.13 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to "CRSI's "Manual of Standard Practice".
   1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.
2.14 CONCRETE MIXING
   A. Ready-Mixed Concrete: Measure, batch, mix and deliver concrete according to ASTM C 94 and ASTM C 1116. Furnish batch ticket information itemizing actual weights or volumes of all materials comprising the mix (total water content must include fine aggregate moisture).
   1. When air temperature is between 85 and 90 degrees F, reduce mixing and delivery time from 90 to 75 minutes; when air temperature is above 90 degrees F, reduce mixing and delivery to 60 minutes.

PART 3 EXECUTION
3.01 FORMWORK
   A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads, and construction loads that might be applied, until concrete structure can support such loads.
   B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 or as indicated.
      1. Lateral alignment tolerance for foundation walls and grade beams: plus 1/4 inch, minus 1/4 inch.
      2. Level alignment/elevation at top of foundation walls and grade beams: plus 1/4 inch, minus 3/8 inch.
      3. Level alignment/flatness at top of foundation walls and grade beams: 1/4 inch/10 foot straightedge.
   C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
      1. Class A, 1/4 inch: Foundation walls and grade beams.
      2. Class B, 1 inch: Footings.
   D. Construct forms tight enough to prevent loss of concrete mortar.
   E. For all concrete exposed to view PROVIDE SMOOTH CAULK FILLING AT ALL FORM-PANEL JOINTS TO RESULT IN SMOOTH WALL SURFACE.
   F. Fabricate forms for easy removal without hammering and prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
      1. Do not use rust-stained steel form-facing material.
   G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
   H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted on forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
   I. Chamfer all exterior corners and edges of permanently exposed concrete.
   J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in this work. Determine sizes and locations rom trades providing such items.
   K. Clean forms and adjacent surfaces to receive concrete. Remove all chips, wood, sawdust, dirt, and other debris just before placing concrete.
   L. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
   M. Coat contact surfaces of forms with foam-release agent, according to manufacturer's written instructions, before placing reinforcement. Do not containment reinforcing with form-release agent.
3.02 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install and accurately hold anchor rods perpendicular to the theoretical bearing surface. As constructed tolerances, as compared to Design Plans, are as follows:

2. Install and accurately hold embedment plates flush with concrete face. As constructed tolerances, as compared to Design Plans, as follows:

3.03 REMOVING AND REUSING FORMS

A. General: Formwork for sides and beams, walls, columns, and similar parts of work that does not support weight of concrete may be removed after cumulatively curing not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28 day design compressive strength.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.04 STEEL REINFORCEMENT

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

B. Clean reinforcement of loose rust and mill scale, soil, ice, oils and other foreign materials.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain specified location or minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, away from exposed concrete surfaces.

E. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

3.05 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated.

2. Form from preformed galvanized steel, plastic keyway-section forms, or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.

3. Locate joints where indicated.

4. Space vertical joints as indicated.
5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces where indicated.

C. Contraction Joints in Slabs-on-Grade: Construct weakened plane contraction joints, sectioning concrete into areas as follows:
   1. Sawed Joints: Construct contraction joints with power saws. Soft cut 1/8 inch wide joints in concrete when cutting action will not tear, abrade, or otherwise damage surface but before concrete develops random contraction cracks - generally within 8 hours of concrete finishing.

D. Isolation Joints in Slab-on-Grade: After removing formwork, install joint filler at slab junctions with vertical surfaces, such as column pedestals, and foundation walls unless indicated otherwise. Joint filler must cover the full depth of slab except where sealant reservoir is required on the top edge.
   1. Hold joint filler 1/2 inch below slab surface and seal.

3.06 WATERSTOPS

A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths possible.

3.07 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement and embedded items are complete, that control survey verifies specified tolerances are achieved, and that required inspections have been performed.

B. Before placing concrete, water withheld at batch plant, if any, may be added at project site to reach slump limits indicated. In no case shall the water/cementitious ratio be exceeded.
   1. Do not add water after compressive test specimens have been taken.
   2. Do not re-temper more than once per ACI 301 criteria.
   3. Confirm batch/time of delivery for placement within allowable ACI 301 criteria of 90 minutes maximum or 300 drum revolutions.

C. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. Deposit concrete to avoid segregation.
   1. Deposit concrete in wall forms in horizontal layers no deeper than 36 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
   2. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
   3. Do not use vibrators to transport concrete inside forms. Quickly insert and slowly withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer, then slowly withdraw at an approximate rate of 3 seconds per vertical foot. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, hold duration of vibration time as necessary to consolidate concrete and complete embedment of reinforcement and other embedded items.

D. Cold-Weather placement: Comply with ACI 306.1-02 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When air temperature has fallen to or is expected to fall below 40 degrees F, for several consecutive days, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F 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, or other materials containing antifreeze agents in the concrete mix.
E. Hot-Weather Placement: Place concrete according to recommendations in ACI 305.1-06 and as follows, when hot weather conditions exist:
   1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Shading and sprinkling aggregate stock piles and/or using chilled mixing water or chopped ice may be used to control temperature, provided water equivalent(s) are calculated to total amount of mixing water.
   2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient temperature before placing concrete.
   3. May fog spray forms and steel reinforcement before placing concrete.

3.08 FINISHED FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height.
   1. Apply to concrete surfaces exposed to public or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, or painting.

C. Rubbed Finish: Apply the following to smooth-formed finished as cast concrete where indicated:
   1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
   2. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

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

3.09 FINISH SLABS

A. General: Comply with recommendations in ACI 302.1R for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces during finishing operations. Coordinate finish with architectural finish plans or intended use.

B. Surface tolerances for slabs are as follows: (Anticipate some grinding at construction joints).
   1. Finish surface such that the gap at any point between concrete surface and an unleveled freestanding 10 foot long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed the following:
      a. Plus 1/4 inch, minus 1/4 inch - slabs on grade.
   2. Finish surface such that any single spot measured does not exceed the following:
      a. Plus 1/2 inch, minus 1/2 inch - slab on grade.
   3. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 155M), for randomly trafficked floor surface:
      a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.
      b. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slab on grades.
      c. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and the levelness, F(L) 15; for suspended slabs.
d. Specified overall values of flatness, F(F) 45; and of levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and of levelness, F(L) 24.

C. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph applied coatings or floor covering.
   1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with floor materials or treatments.
   2. Alternate Finish: Apply finish required for special coverings in accordance with specifications for such coverings.

3.10 MISCELLANEOUS CONCRETE ITEMS
A. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.
B. Steel Pan Stairs: Provide concrete fill for steel pan treads, stair landings, and associated items. Cast-in inserts and accessories as shown on the drawings. Screed, tamp, and trowel finish concrete surface.

3.11 CONCRETE PROTECTION AND CURING
A. General: Protect freshly placed concrete from premature drying and excessive cold and hot temperatures. Comply with ACI 306R for cold weather protection and with recommendations in ACI 305R for hot weather protection during curing.
B. Formed Surfaces: Cure formed concrete surfaces, including sides of beams or walls, and other similar surfaces. If removing forms before end of three days curing period, continue curing by applying curing compound.
C. Unformed Surfaces: Cure by covering for three days or applying curing compound beginning immediately after concrete placement.
D. Evaporation Retarder: Apply evaporation retarder to concrete slab surfaces in warm, dry, or windy conditions before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or drying concrete, but before float finishing.
E. Slab Surfaces: Begin curing immediately after finishing concrete by the following method:
   1. Moisture-Retaining Cover Curing: Immediately after finishing, cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped and sealed. Cure for at least seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape. Comply with cover manufacturer's recommendation.

3.12 JOINT FILLER
A. Prepare, clean, and install joint filler according to manufacturer's written instructions and in accordance with Division 07 Section - Joint Sealants.
   1. Defer joint filling as long as possible, preferably after concrete has aged at least three months. Do not fill joints until construction traffic has permanently ceased.
   2. Saw cut sealant reservoir (final pass) where detailed on plans. Remove dirt, debris, saw cutting and sealers from joints; leave contact faces of joint clean and dry.

3.13 CONCRETE SURFACE REPAIRS
A. Defective Concrete: The contractor is solely responsible for the concrete work being within tolerances and quality appearance. Surfaces exceeding tolerances shall be corrected by an industry acceptable method, submitted by the contractor for review by the engineer. Where satisfactory correction of work cannot be accomplished, the contractor shall remove all defective concrete, as directed. Full cost of removal of non-conforming concrete and its replacement with concrete meeting the specified tolerances shall be borne by the contractor.
Repair and patch defective areas when approved by the Engineer. Remove and replace concrete that, in the engineer's judgement, cannot be successfully repaired or patched.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing. Employ same source of cement and aggregate as used in the parent concrete.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
   1. Immediately after removal of forms remove wooden cones or cut of metal ties at least 1-1/2 back from all exterior surfaces exposed to view or which are to be finished.
   2. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with a bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent. Hammer the grout into the hole until dense and an excess of paste appears on the surface. Trowel smooth with heavy pressure.
   3. If voids exist around reinforcement, chip to provide a clear space at least 3/8 inch wide all around the steel to afford proper ultimate bond thereto. For areas less than 1-1/2 inch deep, the patch may be made in the same manner as described above for filling form tie holes, care being exercised to use adequately dry (non-trowlable) mixtures and to avoid sagging. thicker repairs shall require build up in successive days, each layer being applied (with slurry, etc) as described.
   4. Repair defects on surfaces exposed to view by blending with portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Batch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
   5. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by the Engineer.

D. Repair all cracks as follows:
   1. Repair isolated random cracks on horizontal surfaces exposed to freeze thaw less than 0.020 inch wide, using myethylmethacrylate product specified.
   2. Repair isolated random cracks on horizontal surfaces exposed to freeze thaw 0.020 to 0.040 inch wide, route and seal with specified sealant product.
   3. Repair isolated random cracks on all horizontal surfaces more than 0.040 inch wide, using epoxy injection.
   4. Repair isolated random cracks on vertical surfaces more than 0.025 inch wide, using epoxy injection.
   5. Use epoxy-based mortar for structural repairs, where directed by the engineer.
   6. Use pressure injected epoxy for structural repairs, where directed by the engineer.

E. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.

3.14 FIELD QUALITY CONTROL

A. Testing and Inspection Agency: Owner will engage a qualified independent testing and inspection agency to sample materials, perform tests, and inspections and submit reports. Sampling and testing for quality control includes items specified below.
   1. The contractor must advise the Testing and Inspection Agency at least 36 hours in advance of concrete placement.
   2. Inspection tasks are outlined in Structural General Notes on Plans.

B. Concrete Testing: Testing of composite samples of fresh concrete obtained according to ASTM C 1172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain at least one composite sample for each 50 cu. yd. or fraction thereof of each concrete mix placed each day for all daily placements over 5 C.Y.
   a. When frequency of testing will provide fewer than five compressive-strength tests for concrete mix, testing shall be conducted from at least five randomly selected batches.
2. Testing Location: Final fresh concrete properties shall be tested and recorded or samples taken at point of use i.e. test materials as placed.
3. Slump: ASTM C 143; one tests at point of placement for each composite sample, but not less than one test for each day’s pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample at point of placement, but not less than one test for each day’s pour of each concrete mix.
5. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below or when 80 deg F and above, and one test for each composite sample.
6. Compression Test Specimens: ASTM C 31/C 31M; cast; from material at point of placement, and laboratory cure one set of three standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C 39; test one laboratory-cured specimen at 7 days and two at 28 days, maintain one specimen in reserve for each sample.
   a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.
   b. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

C. The concrete testing technician must immediately inform the contractors project superintendent of sample test results.
   1. Concrete incorporated in the work that does not comply with all specified fresh concrete properties is subject to rejection and replacement at the contractor’s expense.

D. Testing results shall be reported in writing to Engineer, Concrete Manufacturer, and Contractor within 48 hours of testing. Reports of tests shall contain project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in work by grid designation and elevation, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for 28 day tests.

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

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Engineer.

G. Correct deficiencies in the work, that test reports and inspections indicate does not comply with the contract documents, as directed by the engineer.

END OF SECTION
SECTION 03 4500
PRECAST ARCHITECTURAL CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Architectural precast concrete copings.
   B. Supports, anchors, and attachments.

1.02 RELATED REQUIREMENTS
   A. Section 03 3000 - Cast-in-Place Concrete: Admixtures.
   B. Section 07 9005 - Joint Sealers: Perimeter joints with sealant and backing.

1.03 REFERENCE STANDARDS
   A. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).
   B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.
   G. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2012.
   K. IAS AC157 - Accreditation Criteria for Fabricator Inspection Programs for Reinforced and Precast/Prestressed Concrete; 2010.

1.04 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Manufacturer's information on accessory products, including pigments, admixtures, inserts, plates, etc.
   C. Shop Drawings: Indicate layout, unit locations, configuration, unit identification marks, reinforcement, integral insulation, insulated panel system connectors, connection details, support items, location of lifting devices, dimensions, openings, and relationship to adjacent materials. Provide erection drawings.
      1. Include details of mix designs.
D. Samples: Provide one sample on site, 24" long, profiled to match project coping, illustrating surface finish, color and texture.

E. LEED Submittal: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete, mix design(s) used showing the quantity of Portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used; use LEED New Product Content Form.

F. LEED requirements: all aggregate and cement to be sourced within 500 miles of project site.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications:
   1. Plant certified under Precast/Prestressed Concrete Institute Plant Certification Program; product group and category A1 - Architectural Precast Concrete.

1.06 MOCK-UP

A. Include mock-up panel with typical window.
B. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handling: Lift and support precast units only from support points.
B. Protect units to prevent staining, chipping, or spalling of concrete.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Architectural Precast Concrete:
   1. Any manufacturer holding a PCI Group A Plant Certification for the types of products specified; see www.pci.org.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PRECAST UNITS

A. Precast Architectural Concrete Units: Comply with PCI MNL-120, PCI MNL-122, PCI MNL-123, PCI MNL-135, and ACI 318.
   1. Design Loads: Static loads, anticipated dynamic loading, including positive and negative wind loads, thermal movement loads, and erection forces as defined by applicable code.
   2. Calculate structural properties of units in accordance with ACI 318.
   3. Accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
   4. Provide connections that accommodate building movement and thermal movement and adjust to misalignment of structure without unit distortion or damage.

2.03 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 40 (40,000 psi).
   1. Epoxy coated in accordance with ASTM A775/A775M.

2.04 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
C. Water: Clean and not detrimental to concrete.
D. Admixtures: Air entrainment as specified in Section 03 3000.
2.05 SUPPORT DEVICES
   A. Connecting and Support Devices; Anchors and Inserts: ASTM A36/A36M steel; hot-dip galvanized in accordance with ASTM A153/A153M.
      1. Clean surfaces of rust, scale, grease, and foreign matter.

2.06 MIX
   A. Concrete: Minimum 5000 psi, 28 day strength, air entrained to 5 to 7 percent in accordance with ACI 301.

2.07 FABRICATION
   A. Fabricate in conformance with PCI MNL-117 and PCI MNL-135.
   B. Fabricate and handle epoxy-coated reinforcing bars in accordance with ASTM D3963/D3963M.
   C. Maintain plant records and quality control program during production of precast units. Make records available upon request.
   D. Use rigid molds, constructed to maintain precast unit uniform in shape, size, and finish.
   E. Maintain consistent quality during manufacture.
   F. Fabricate connecting devices, plates, angles, items fit to steel framing members, inserts, bolts, and accessories. Fabricate to permit initial placement and final attachment.
   G. Embed reinforcing steel, anchors, inserts plates, angles, and other cast-in items.
   H. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
   I. Minor patching in plant is acceptable, providing structural adequacy and appearance of units is not impaired.

2.08 FINISH - PRECAST UNITS
   A. Finish Type A: Smooth steel form finish with not visible form lines. Ensure exposed-to-view finish surfaces of precast units are uniform in color and appearance.

2.09 FABRICATION TOLERANCES
   A. Conform to PCI MNL-117 and PCI MNL-135, except as specifically amended below.

2.10 SOURCE QUALITY CONTROL
   A. Provide testing of concrete mix.
   B. Take one concrete test cylinders for every 20 cu yd of concrete placed; make and cure in accordance with ASTM C31/C31M.
   C. Take one air entrainment test cylinders for each set of exterior concrete test cylinders taken.
   D. Take water absorption test in accordance with PCI MNL-117.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that building structure, anchors, devices, and openings are ready to receive work of this section.

3.02 ERECTION
   A. Erect units without damage to shape or finish. Replace or repair damaged panels.
   B. Erect units level and plumb within allowable tolerances.
   C. Align and maintain uniform horizontal and vertical joints as erection progresses.
   D. When units require adjustment beyond design or tolerance criteria, discontinue affected work; advise Mosaic Architecture.
   E. Fasten units in place with mechanical connections.
   F. Exposed Joint Dimension: 1/2 inch. Adjust units so that joint dimensions are within tolerances.
G. Seal perimeter and intermediate joints in accordance with Section 07 9005.

3.03 TOLERANCES

A. Erect members level and plumb within allowable tolerances. Conform to PCI MNL-135, except as specifically amended below.
   1. Maximum Plumb Variation Over Height of Structure or 100 ft (whichever is less): Plus or minus 1/2 inch.
   2. Exposed Joint Dimension: Plus or minus 3/16 inch.

END OF SECTION
SECTION 04 2001
MASONRY VENEER

PART 1  GENERAL

1.01  SECTION INCLUDES
A. Clay Facing Brick.
B. Mortar and Grout.
C. Reinforcement and Anchorage.
D. Flashings.
E. Installation of Lintels.
F. Accessories.
G. Ties and Anchors

1.02  RELATED REQUIREMENTS
A. Section 05 4000 - Cold-Formed Metal Framing: Steel stud backup for masonry veneer.
B. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.
C. Section 07 9005 - Joint Sealers: Backing rod and sealant at control and expansion joints.

1.03  REFERENCE STANDARDS
E. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2014.
H. BIA Technical Notes No. 7 - Water Penetration Resistance - Design and Detailing; 2005.
I. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls; 2005.

1.04  SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data for masonry units, fabricated wire reinforcement, and mortar.
C. Samples: Submit two samples of facing brick units to illustrate color, texture, and extremes of color range.
D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
E. Mix Design: For mortar include description of type and proportions of ingredients.
   1. Include test reports, per ASTM C 780, for mortar mixes required to comply with specifications.
F. Cold Weather Procedures: Detailed description of methods, materials and equipment to be used to comply with cold-weather requirements.
G. LEED Submittal:
1. Product Data for MR 5: Regional Materials. For products that have been extracted, harvested or recovered, as well as manufactured within 500 miles of the project site. ALL MATERIALS AS REQUIRED TO BE SOURCED AND MANUFACTURED WITHIN 500 MILES OF PROJECT SITE.

2. Product Data for Credit MR4.1 and Credit MR4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.

H. Shop Drawings: For the following:
   1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
   2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

1.05 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

C. Testing Service: Owner will engage a qualified independent testing agency to perform testing indicated below. Payment for these services will be made by the Owner. Retesting of materials that fail to meet specified requirements shall be done at the contractor's expense.
   1. Mortar Test (Property Specifications): For each mix required, per ASTM C 780 and table 2103.7(2) IBC 2006.

1.06 MOCK-UP

A. Construct a masonry wall as a mock-up panel sized 8 feet long by 6 feet high for each type/coursing area; include mortar and accessories and structural backup in mock-up. Multiple mock-ups may be necessary to show full extent of sourcing and joints.

B. Locate where directed.

C. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

B. Handle and store ceramic glazed masonry units in protective cartons or trays. Do not remove from protective packaging until ready for installation.

1.08 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 BRICK UNITS

A. Manufacturers:
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Facing Brick: ASTM C216, Type FBS, Grade SW.
   1. Manufacturer: Mutual Materials;
   2. Color and Texture:
      a. Color: TBD: basis for bid - Mutual Materials Inca blend or equal
      b. Texture: Smooth.
      c. Norman Face Brick- 3-5/8" x 2-1/4" x 11-5/8".
2.02 MORTAR AND GROUT MATERIALS

A. Mortar Aggregate: ASTM C144.

B. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
   1. Color(s): As selected by Mosaic Architecture from manufacturer's full range. Expect the color to be in the dark grey range.
   2. Manufacturers:
      b. Substitutions: See Section 01 6000 - Product Requirements.

C. Water: Clean and potable.

D. Accelerating Admixture: Nonchloride type for use in cold weather.

E. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.

2.03 REINFORCEMENT AND ANCHORAGE - SEE STRUCTURAL DRAWINGS FOR ADDITIONAL INFORMATION

A. Manufacturer's of Brick Ties:
   1. Manufacturers:
      a. WIRE-BOND; www.wirebond.com
      b. Hohman & Barnard, Inc.; www.h-b.com
      c. Substitutions: See Section 01 6000 - Product Requirements.

B. Brick Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B, sized to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face and allow vertical adjustment of up to 1-1/4 inch.
   1. Anchor Plate: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
   2. Vertical Spacing: 16" O.C.
   3. Horizontal Spacing: 16" O.C.
   4. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
   5. Seismic Feature: Provide lip, hook, or clip on end of wire ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter.

C. Dovetail Anchors for Concrete: Dovetail slots 1" 22 ga. galvanized 12 ga. x 1" triangular tie, conforming to ASTM A82. Size as applicable.

D. Anchors specifically noted on the plans shall supersede duplicate notes of this specification.

2.04 FLASHINGS

A. Rubberized Asphalt Flashing: Self-adhering polymer-modified asphalt sheet; 0.025 inch total thickness; with cross-linked polyethylene top and bottom surfaces.
   1. Manufacturers:
      a. Carlisle; Product CCW-705-TWF, Thru Wall Flashing.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.05 ACCESSORIES

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.

B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding.

C. Weep Vent Material:
   1. Description: Non-woven mesh with M-notched bottom. Color to match mortar selected by Architect.
   2. Size: 3/8" x 2-1/2"h x 3-1/2"w.
3. Place weep vents in head joints at exterior wythe of cavity wall located immediately above ledges and flashing, spaced 24 inches on center, unless otherwise shown. Install with notched side down. Leave the side of the brick units forming the vent space unbuttered and clear of mortar. Slide vent material into joint once the brick units forming the weep vent are in place.

4. Submit two samples of weep vent material, actual size and color, and manufacturer's product data sheet.

5. Manufacturers:
   a. CavClear Weep Vents as manufactured by Archovations, Inc; P.O. Box 241; Hudson, WI 54016, 888-436-2620

D. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.

E. Termination Bars and reglets: Stainless steel; compatible with membrane and adhesives.

F. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

PART 3  EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Brick Units:
   2. Coursing: Three units and three mortar joints to equal 8 inches for modular brick.

3.03 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Remove excess mortar as work progresses.

C. Interlock intersections and external corners, except for units laid in stack bond.

D. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

E. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

F. Isolate top joint of masonry veneer from horizontal structural framing members or support angles with compressible joint filler.

3.04 WEEPS/CAVITY VENTS

A. Install weeps in veneer walls at 24 inches on center horizontally above through-wall flashing, above shelf angles and lintels, and at bottom of walls.

B. Install cavity vents in veneer walls at 32 inches on center horizontally below shelf angles and lintels and at top of walls.

C. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

3.05 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
B. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.06 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER
A. Seismic Reinforcement: Connect veneer anchors with continuous horizontal wire reinforcement before embedding anchors in mortar.

3.07 MASONRY FLASHINGS
A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 6 inches into adjacent masonry or turn up at least 8 inches to form watertight pan at non-masonry construction.
B. Extend metal flashings through exterior face of masonry and turn down to form drip.
C. Extend EPDM flashings to within 1/4 inch of exterior face of masonry.
D. Lap end joints of flashings at least 6 inches and seal watertight with flashing sealant/adhesive.
E. Where the flashing is not continuous, such as over and under openings in the wall and on each side of vertical expansion joints, the ends of the flashing should be extended both sides and turned up into the head joints at least 1" at the ends, to form a dam.

3.08 LINTELS
A. Install loose steel lintels over openings unless shown otherwise on drawings.
B. Maintain minimum 8 inch bearing on each side of opening.

3.09 CONTROL AND EXPANSION JOINTS
A. Do not continue horizontal joint reinforcement through control or expansion joints.
B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
C. Size control joint in accordance with Section 07 9005 for sealant performance.
D. Form expansion joint as detailed on drawings.

3.10 BUILT-IN WORK
A. As work progresses, install built-in metal door frames and other items to be built into work and furnished under other sections.
B. Install built-in items plumb, level and true to line.
C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
D. Do not build into masonry construction organic materials that are subject to deterioration.

3.11 TOLERANCES
A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

3.12 CUTTING AND FITTING
A. Cut and fit for pipes and conduit. Coordinate with other sections of work to provide correct size, shape, and location.
B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.
3.13 CLEANING
   A. Remove excess mortar and mortar smears as work progresses.
   B. Replace defective mortar. Match adjacent work.
   C. Clean soiled surfaces with cleaning solution.
   D. Use non-metallic tools in cleaning operations.

3.14 FIELD QUALITY CONTROL
   A. Mortar Verification Proportion: For each mix provided shall conform to ASTM C 270 and Table 2103.7(1) in IBC 2009.

3.15 REPAIRING, POINTING, AND CLEANING
   A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
   B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up all joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
   C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
   D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
      1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
      2. Test cleaning methods on sample wall panel, leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning and masonry.
      3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
      4. Wet wall surfaces with water before applying cleaners: remove cleaners promptly by rinsing surfaces thoroughly with clean water.
      5. Clean brick by bucket-and-brush hand-cleaning method described in "BIA Technical Notes 20."
      6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

END OF SECTION
PART 1 GENERAL

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

1.02 SUMMARY
   A. Section Includes:
      1. Structural Steel.
      2. Field-Installed Shear Connectors.
   B. Related Requirements:
      1. Section 05 3100 "Steel Decking" for field installation of shear connectors through deck.
      2. Section 05 5000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame miscellaneous steel fabrications and other steel items not defined as structural steel.

1.03 DEFINITIONS
   A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
   B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.
   C. Heavy Sections: Rolled and built-up sections as follows:
      1. Shapes included in ASTM A 6/A 6M with flanges thicker than 1-1/2 inches (38 mm).
      2. Welded built-up members with plates thicker than 2 inches (50 mm).
      3. Column base plates thicker than 2 inches (50 mm).
   D. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.
   E. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

1.04 COORDINATION
   A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
   B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.05 PREINSTALLATION MEETING
   A. Preinstallation Conference: Conduct conference at Project site.

1.06 ACTION SUBMITTALS
   A. Product Data: For each type of product.
   B. Shop Drawings: Show fabrication of structural-steel components.
      1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
      2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.

4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.

5. Identify members and connections of the Seismic-Load-Resisting System.

6. Indicate locations and dimensions of protected zones.

7. Identify demand critical welds.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs):
   Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint qualified by testing, including the following:
   1. Power source (constant current or constant voltage).
   2. Electrode manufacturer and trade name, for demand critical welds.

D. Delegated-Design Submittal: For Special Moment Frame (SMF) structural-steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.07 INFORMATIONAL SUBMITTALS

A. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

B. Qualification Data: For Installer fabricator, shop-painting applicators, professional engineer, and testing agency.

C. LEED Submittal:
   1. MR Credit 2: Construction Waste Management: For products being recycled, documentation of total weight of project waste diverted from landfill.
   2. Product Data for Credit MR4.1 and Credit MR4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.

D. Welding certificates.

E. Mill test reports for structural steel, including chemical and physical properties.

F. Product Test Reports: For the following:
   1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
   2. Direct-tension indicators.
   3. Tension-control, high-strength, bolt-nut-washer assemblies.
   4. Shear stud connectors.
   5. Shop primers.

G. Survey of existing conditions.

H. Source quality-control reports.

1.08 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD. Specific to this project, the selected fabricator may not sub-contract any portion of this specification section to another fabricator - regardless of intended subcontract fabricators qualifications.

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M.
FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

D. Comply with applicable provisions of the following specifications and documents:
1. AISC 303.
2. AISC 341 and AISC 341s1.
3. AISC 360.
4. RCSC’s “Specification for Structural Joints Using ASTM A 325 or A 490 bolts.”

1.09 DELIVERY, STORAGE, AND HANDLING
A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
   1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
B. Store fasteners in a protected place in sealed containers with manufacturer’s labels intact.
   1. Fasteners may be repackaged provided Owner’s testing and inspecting agency observes repackaging and seals containers.
   2. Clean and lubricate bolts and nuts that become dry or rusty before use.
   3. Comply with manufacturers’ written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 PRODUCTS
2.01 PERFORMANCE REQUIREMENTS
A. Connections: Provide details of Special Moment Frame connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.
C. Construction: Steel Special Moment Frame.

2.02 STRUCTURAL STEEL MATERIALS
A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so post-consumer recycled content plus one-half of pre-consumer recycled content is not less than 50 percent.
B. W-Shapes: ASTM A 992/A 992M.
C. Channels, Angles (M), (S) Shapes: ASTM A 36/A 36M.
D. Plate and Bar: ASTM A 36/A 36M, unless indicated in the Drawings as “Grad 50”, then provide ASTM A 572/A 572M, Grade 50 (345).
E. Cold Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
F. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
   1. Weight Class: as indicated in the Drawings.
   2. Finish: Black except where indicated to be galvanized.
G. Welding Electrodes: Comply with AWS requirements. Use E70XX electrodes unless noted otherwise or required by WPS.

2.03 BOLTS, CONNECTORS, AND ANCHORS
A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts or tension control, bolt nut washer assemblies with spline ends; ASTM A 562, Grade DH, (ASTM A 563M, Class 10S) heavy hex carbon steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel washers with plain finish.
B. Tension Control, High Strength Bolt Nut Washer Assemblies: Where “A325-SC” tension-control, slip critical bolts are called out in the Drawings, provide ASTM F 1852, Type 1, round head
assemblies, consisting of structural bolts and spline ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
1. Finish: Plain

C. Shear Connectors: ASTM A 108, Grade 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

D. Unheaded Anchor Rods: ASTM F 1554, Grade grade as indicated in the drawings.
5. Finish: Plain.

E. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
1. Finish: Plain.

F. Threaded Rods: ASTM A 36/A 36M or ASTM A 572/A 572M, Grade 50 (345), as indicated in the Drawings.
2. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
3. Finish: Plain.

G. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

2.04 PRIMER

A. Primer: SSPC-Paint 25, Type 1, zinc oxide, alkyd, linseed oil primer.

B. Primer: Fabricators standard lead and chromate free, non-asphaltic, rust-inhibiting primer complying with MPI # 79 and compatible with topcoat.

2.05 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory packaged, non-metallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30 minute working time.

2.06 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to [SSPC-SP 1, "Solvent Cleaning."] [SSPC-SP 2, "Hand Tool Cleaning."] [SSPC-SP 3, "Power Tool Cleaning."]

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
   1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
   2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
   3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.07 SHOP CONNECTORS
   
   A. High Strength Bolts: Shop install high strength bolts according to RCSC's "Specification for Structural Joints using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
      1. Joint Type: as indicated in the Drawings.
   
   B. Weld Connectors: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
      1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.08 SHOP PRIMING
   
   A. Shop prime steel surfaces except the following:
      1. Surface embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
      2. Surface to be field welded.
      3. Surfaces to be high strength bolted and slip critical connections.
      4. Surfaces to receive sprayed fire resistive materials (applied fire proofing).
      5. Galvanized surfaces.
   
   B. Prepare slip critical (listed as A325-SC in the drawings connection surfaces to satisfy Class A fraying surface requirements of RCSC's "Specification for Structural Joints using ASTM A 325 or A 490 Bolts.
   
   C. Surface Preparations: Clean surface to be painted. Remove loose rust and mill scale and spatter, slag or flux deposit. Prepare surfaces according to the following specifications and standard.
      1. SSPC-SP-2, "Hand Tool Cleaning."
   
   D. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at a rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surface.

2.09 SOURCE QUALITY CONTROL
   
   A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
      1. Provide testing agency with access to places where structural steel work is being fabricated and produced to perform tests and inspections.
   
   B. Bolted Connections: Shop bolted connections will be inspected according to RCSC's "Specification for Structural Joints using ASTM A 325 or A 490 Bolts" and AISC 341-10 "Seismic Provisions for Structural Steel Buildings."
   
   C. Welded Connections: In addition to visual inspection, shop welded connections will be tested and inspected according to AWS D1.1/D1.1M and AISC 341-10 CHJ 360-10 CHN and the following inspection procedures, at testing agency option:
      1. Liquid Penetrate Inspection: ASTM E 165.
      2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will be accepted.
      4. Radiographic Inspection: ASTM E 94.
D. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

E. Prepare test and inspection reports.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify with steel erector present, elevations of concrete and masonry bearing surfaces and locations of anchor rods, bearing plates and other embedment for compliance with requirements.
   1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

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

3.02 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
   1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.03 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in compliance with AISC "Code of Standard Practice for Steel Buildings and Bridges." AISC 303 and AISC 360.

   1. Set plates for structural members on wedges, shims, or setting nuts as required.
   2. Weld plate washers to top of baseplate.
   3. At the braced frame baseplates, if setting/leveling nuts are used, shim with steel and back-off leveling nuts prior to snug tightening anchor rods and grouting below baseplate.
   4. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
   5. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
   1. Level and plumb individual members of structure.
   2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.
F. Do not use thermal cutting during erection unless approved by Architect in writing. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must have been larged to admit bolts.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.04 FIELD CONNECTIONS

A. High Strength Bolts: Install high strength bolts according to RCSC's "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
1. Joint Type: Snug tightened, Pretensioned slip critical.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality and methods used in correcting welding work.
1. Comply with AISC 303 and AISC 360 for bearing, alignment adequacy of temporary connections, and removal of paint on surface adjacent to field welds.
2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.

3.05 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.
4. Perform Pre-Installation Verification Testing of Bolted Assemblies Prior to Steel Erection.

B. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
1. Provide testing agency with access to places where structural steel work is being fabricated and produced to perform tests and inspections.

C. Bolted Connections: Shop bolted connections will be inspected according to RCSC's "Specification for Structural Joints using ASTM A 325 or A 490 Bolts" and AISC 341-10 "Seismic Provisions for Structural Steel Buildings."

D. Welded Connections: In addition to visual inspection, shop welded connections will be tested and inspected according to AWS D1.1/D1.1M and AISC 341-10 CHJ 360-10 CHN and the following inspection procedures, at testing agency's option:
1. In addition to visual inspections, field welds will be tested and inspected according to AWS D1.1/D 1.1M and the following inspection procedures, at testing agency's option:
   a. Liquid Penetrant Inspection: ASTM E 165.
   b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will be accepted.
   c. Ultrasonic Inspection: ASTM E 164.
   d. Radiographic Inspection: ASTM E 94.

E. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

F. Prepare test and inspection reports.
3.06 REPAIRS AND PROTECTION

A. Touch-up Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Clean and prepare surfaces by SSPC-SP 2 hand tool cleaning or SSPC-SP 3 power-tool cleaning.

B. Touch-Up Painting: Cleaning and touchup painting are specified in Section 09 9000 Interior Painting and Section 09 9600 Exterior Painting.

END OF SECTION
SECTION 05 3100
STEEL DECKING

PART 1 GENERAL

1.01 SUMMARY
A. Section Includes:
   1. Roof deck.
   2. Composite floor deck, roof deck (without concrete).
B. Related Requirements:
   1. Section 033000 "Cast-in-Place Concrete" for normal-weight structural concrete fill over steel deck.
   2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
   3. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.02 ACTION SUBMITTALS
A. Product Data: For each type of deck, accessory, and product indicated.
B. Shop Drawings:
   1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.03 INFORMATIONAL SUBMITTALS
A. LEED Submittal:
   1. MR Credit 2: Construction Waste Management: For products being recycled, documentation of total weight of project waste diverted from landfill.
   2. Product Data for Credit MR 4.1 and Credit MR 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer pre-consumer recycled content.
      a. Include statement indicating costs for each product having recycled content.
   3. MR Credit 5: Local and Regional Materials: Product Data for Credit MR 5.1 and Credit MR 5.2. Submit data, including location and distance from project of material manufacturer and point of extraction, harvest or recovery for main raw material.
B. Shop Drawing: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments of other construction.
C. Product certificates.
D. Welding certificates.
E. Field quality-control test and inspection reports.
F. Research/Evaluation Reports: For steel deck.

1.04 QUALITY ASSURANCE
A. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."
B. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Fire-Resistance Rating: Indicated by design designations of applicable testing and inspecting agency.
   2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.
C. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specifications for the Design of Cold-Formed Steel Structural Members."
D. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so post-consumer recycled content plus one-half of post-consumer recycled content is not less than 25 percent.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.02 ROOF DECK (NON-COMPOSITE DECKING)

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. ASC Profiles, Inc.; a Blue Scope Steel company.
   2. Canam United States; Canam Group Inc.
   4. Roof Deck, Inc.
   5. Verco Manufacturing Co.
   6. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
   1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating.
   2. Deck Profile: As indicated.
   3. Cellular Deck Profile: As indicated, with bottom plate.
   4. Profile Depth: As indicated.
   5. Design Uncoated-Steel Thickness: As indicated.
   6. Span Condition: As indicated.
   7. Side Laps: Overlapped.

2.03 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:
   1. Galvanized and Shop Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (G90 or better) zinc coating; cleaned, pretreated and primed with manufacturer's standard baked on, rust inhibitive primer.
   2. Deck Profile: Type WR, wide rib.
   3. Profile Depth: As indicated on drawings.
   4. Design Uncoated Steel Thickness: As indicated on drawings.

2.04 COMPOSITE FLOOR DECK

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. ASC Profiles, Inc.; a Blue Scope Steel company.
   2. Canam United States; Canam Group Inc.
   4. Roof Deck, Inc.
5. Verco Manufacturing Co.
6. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

B. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
   1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 (230), G60 (Z180) zinc coating.
   2. Profile Depth: As indicated.
   3. Design Uncoated-Steel Thickness: As indicated.
   4. Span Condition: As indicated.

2.05 ACCESSORIES
   A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
   B. Mechanical Fasteners: Corrosion resistant, low velocity, power actuated or pneumatically drive carbon fasteners; or self drilling, self threaded screws.
   C. Side Lap Fasteners: Corrosion resistant, hexagonal washer head; self drilling, carbon steel screws, No. 10 minimum diameter.
   D. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359 inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
   E. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi (230 MPa), of same material and finish as deck, and of thickness and profile indicated.
   F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
   G. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck. For drains, cut holes in the field.
   H. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch (1.90 mm) thick, of same material and finish as deck, with 3-inch- (76-mm-) wide flanges and level recessed pans of 1-1/2-inch (38-mm) minimum depth. For drains, cut holes in the field.

PART 3 EXECUTION
3.01 EXAMINATION
   A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
   B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL
   A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, requirements in this section, and as indicated.
   B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
   C. Locate deck bundles to prevent overloading of supporting members.
   D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
   E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Alternate fasteners from those indicated in the Drawings will not be considered without following the substitutions procedures outlined in the Division 1 specification sections.

3.03 ROOF DECK INSTALLATION
A. Fasten roof-deck panels to steel supporting members as indicated in the Drawings.
B. Side-Lap and Perimeter Edge Fastening: As indicated in the Drawings.
C. End Bearing: Install deck ends over supporting frame as indicated in the drawings, with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
   1. End Joints: Lapped 2 inches (51 mm) minimum.
D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches (305 mm) apart with at least one fastener at each corner.
   1. Install reinforcing channels or zees in ribs to span between supports and mechanically fasten.
E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Mechanically fasten to substrate to provide a complete deck installation.
   1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

3.04 FLOOR DECK INSTALLATION
A. Fasten floor-deck panels to steel supporting members as indicated in the Drawings.
B. Side-Lap and Perimeter Edge Fastening: As indicated in the Drawings.
C. End Bearing: Install deck ends over supporting frame as indicated in the drawings, with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
   1. End Joints: Lapped 2 inches (51 mm) minimum.
D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.
E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.05 FIELD QUALITY CONTROL
A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
B. Field welds will be subject to inspection.
C. Testing agency will report inspection results promptly and in writing to contractor and Architect.
D. Remove and replace work that does not comply with specified requirements.
E. Additional inspecting, at contractors expense, will be performed to determine compliance of corrected work with specified requirements.

3.06 PROTECTION
A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
B. Repair Painting: Wire brush and clean rust spots, welds, abraded areas on top of surface of prime painted deck immediately after installation and apply repair paint.

END OF SECTION
SECTION 05 4000
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Formed steel stud exterior wall and interior wall framing.
B. Exterior wall sheathing.
C. Formed steel joist and purlin framing and bridging.
D. Water-resistive barrier over sheathing.

1.02 PERFORMANCE REQUIREMENTS
A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated:
   1. Design Loads: As indicated on drawings.
   2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
      a. Exterior Non-Loading Bearing Framing: Horizontal deflection of 1/600 of the wall height.

1.03 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.
C. LEED Submittals:
   1. MR Credit 2: Construction Waste Management: For products being recycled, documentation of total weight of project waste diverted from landfill.
   2. Product Data for Credit MR4.1 and MR Credit 4.2: For products having recycled content, documentation indicating percentage by weight of post-consumer and pre-consumer recycled content.
   3. Include statement indicating costs for each product having recycled content.
   4. MR Credit 5: Local and Regional Materials: Product Data for Credit MR 5.1 and Credit MR 5.2. Submit data, including location and distance from project of material manufacturer and point of extraction, harvest or recovery for main raw material.
D. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading welds, and type and location of fasteners, and accessories or items required of related work.
E. Welding Certificates.
F. Qualification data.
G. Product test reports.
H. Research/evaluation reports.

1.04 QUALITY ASSURANCE
A. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements.
C. Fire Test Response Characteristics: Where indicated, provide cold formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
D. AISI Specifications and Standards: Comply with AISI "North American Specifications for the Design of Cold Formed Steel Structural Members" and its "Standard for Cold Formed Steel framing - General Provisions."
PART 2 PRODUCTS

2.01 MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so post-consumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated of grade and coating weight as follows:
   1. Grade: ST50H
   2. Coating: G60.
      a. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com
      b. SCAFCO Steel Stud Mfr Co
      c. Substitutions: See Section 01 6000 - Product Requirements.

2.02 EXTERIOR NON-LOAD BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base Metal Thickness: As indicated on drawings.
   3. Section Properties: As indicated on drawings.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with un-stiffened flanges, and same minimum base metal thickness as steel studs.

C. Vertical Deflection Clips: Manufacturer standard by-pass clip, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment of stud web. Provide service load capacity as indicated in the drawings.

2.03 FRAMING ACCESSORIES

A. Fabricate steel framing accessories from steel sheet, ASTM A 1003/A 103M, Structural grade, Type H, metallic coated, of same grade and coating weight used for framing members, unless otherwise indicated.

B. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot dip process according to ASTM A 123/A 123M.

C. Power Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM R 1190 conducted by a qualified independent testing agency.

   1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.04 MISCELLANEOUS MATERIALS

A. Galvanized Repair Paint: SSPC-Paint 20 or DOD-P-21035.

B. Cement Grout: Portland cement, ASTM C 150, Type 1; and clean, natural sand, ASTM C 404. Mix ratio of 1 part cement of 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Shims: Load bearing, high density multimonomer plastic, nonleaching.

D. Sealer Gaskets: Closed cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

PART 3 EXECUTION

3.01 PREPARATION

A. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.
3.02 INSTALLATION OF STUDS

A. Install cold formed metal framing according to AISC's "Standard for Cold Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

B. Install cold formed metal framing and accessories plumb, square and true to line, and with connections securely fastened.

C. Install framing members in one piece lengths.

D. Install temporary bracing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

E. Install insulation - "thermal insulation" in built up exterior framing members, such as headers, sills, boxed joists, and multiple studs at opening that are inaccessible on completion of framing work.

F. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

G. Erection Tolerances: Install cold formed metal framing level, plumb and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.03 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows: See drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

D. Isolate non-load bearing steel stud framing from building structure to prevent transfer of vertical loads while providing lateral support.
   1. Connect vertical deflection clips to bypassing studs and anchors to primary building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
   1. Bridging: Cold rolled steel channel, welded or mechanically fastened to webs of punched studs.
   2. Bridging: Combination of flat, steel sheet straps of widths and thickness indicated and stud track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
   3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners and stud girts, to provide a complete and stable curtain wall framing system.

3.04 FIELD QUALITY CONTROL

A. Field and shop welds will be subject to testing and inspecting.

B. Remove and replace work where test results indicate that it does not comply with specified requirements.

C. Additional testing and inspecting, at contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
3.05 REPAIRS AND PROTECTION
   A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
   B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure that cold-formed metal framing is without damage or deterioration at time of substantial completion.

END OF SECTION
SECTION 05 5000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INC
A. Shop fabricated steel items.

1.02 RELATED REQUIREMENTS
A. Section 05 5100 - Metal Stairs.
B. Section 05 5213 - Pipe and Tube Railings.
C. Section 09 9113 - Exterior Painting: Paint finish.

1.03 REFERENCE STANDARDS
J. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric); 2014.
K. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.
P. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric); 2012.
S. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
V. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
X. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. LEED Submittal:
   1. Product data for MR Credit 4.1 and MR Credit 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.
   2. Include statement indicating costs for each product having recycled content.
   3. MR Credit 5: Local and Regional Materials: Product Data for Credit MR 5.1 and Credit MR 5.2. Submit data, including location and distance from project of material manufacturer and point of extraction, harvest or recovery for main raw material.
C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
D. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS
2.01 MATERIALS - STEEL
A. Steel Sections: ASTM A36/A36M.
B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.
C. Plates: ASTM A283.
E. Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1, plain.
F. Bolts, Nuts, and Washers embedded in concrete at exterior: 316 Stainless steel.
G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
I. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION
A. Fit and shop assemble items in largest practical sections, for delivery to site.
B. Fabricate items with joints tightly fitted and secured.
C. Continuously seal joined members by intermittent welds and plastic filler.
D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
2.03 FABRICATED ITEMS

A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments; prime paint finish.
   1. Side Rails: 3/8 x 2 inches members spaced at 20 inches.
   2. Rungs: one inch diameter solid round bar spaced 12 inches on center.
   3. Space rungs 7 inches from wall surface.
B. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.
C. Tree surrounds: grate and tree protectors as detailed: A606 (corten) steel plate, fabricated in thicknesses indicated on drawings.
D. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.
E. Lintels: As detailed; prime paint finish.
F. Elevator Hoistway Divider Beams: Beam sections; prime paint finish.
G. Exterior steel stairs: hot dip galvanized steel, detailed as shown on drawings
H. Exterior steel stair treads: hot dip galvanized steel grating.
I. Supported Angles: Miscellaneous Cabinetry Countertop Support Angles Where Detailed and Attached to Wall Type: Support angles for miscellaneous channel header support for movable partitions and overhead mounted toilet partitions.
J. Downspout Chains: 3/8" galvanized steel chain.
K. Channel Support Framing: Overhead partitions and movable partitions.

2.04 FINISHES - STEEL

A. Prime paint steel items.
   1. Exceptions: Galvanize items to be embedded in concrete, items to be imbedded in masonry, and items specified for galvanized finish.
   2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
B. Prepare surfaces to be primed in accordance with SSPC-SP2.
C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
D. Prime Painting: One coat.
E. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.
F. A606 (corten): natural finish left to naturally oxidize.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.
B. Maximum Offset Between Faces: 1/16 inch.
C. Maximum Misalignment of Adjacent Members: 1/16 inch.
D. Maximum Bow: 1/8 inch in 48 inches.
E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.
B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.
3.03 INSTALLATION
   A. Install items plumb and level, accurately fitted, free from distortion or defects.
   B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
   C. Field weld components as indicated on drawings.
   D. Perform field welding in accordance with AWS D1.1/D1.1M.
   E. Obtain approval prior to site cutting or making adjustments not scheduled.
   F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES
   A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
   B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION
SECTION 05 5100
METAL STAIRS

PART 1 GENERAL
1.01 SECTION INCLUDES
   A. Stairs with grating treads.
   B. Prefabricated stairs.
   C. Structural steel stair framing and supports.
   D. Handrails and guards.

1.02 RELATED REQUIREMENTS
   A. Section 03 3000 - Cast-in-Place Concrete: Concrete fill in stair pans; mesh reinforcement for landings.
   B. Section 05 5213 - Pipe and Tube Railings: Metal handrails for the stairs specified in this section.
   C. Section 09 9113 - Exterior Painting: Paint finish.

1.03 REFERENCE STANDARDS
   A. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
   C. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc; 2011.

1.04 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Provide data on all materials, connectors, and finishes.
   C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
      1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   D. LEED Submittal:
      1. Product data for Credit MR 4.1 and Credit MR 4.2: Indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.
      2. Include statement indicating costs for each product having recycled content.
      3. MR Credit 5: Local and Regional Materials: Product Data for Credit MR 5.1 and Credit MR 5.2. Submit data, including location and distance from project of material manufacturer and point of extraction, harvest or recovery for main raw material.
   E. Welders' Certificates.
   F. Shop Drawings for Ladders:
      1. Plan and section of ladder installation.

1.05 QUALITY ASSURANCE
   A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.
      1. Preassembled Stairs: Commercial class.
2. Industrial-Type Stairs: Industrial class.

B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.01 METALS

A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the complete work, provide materials without seam marks, roller marks, roller marks, rolled trade names or blemishes.

B. Recycled Content of Steel Products: Provide products with average recycled content of steel products so post-consumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

C. Steel Plates, Shapes and Bars: ASTM A 36/A 26M.

D. Steel tubing: ASTM A 500 (cold formed).

E. Rolled Steel Floor Plate: ASTM A 768/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

F. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

G. Uncoated, Cold-rolled Steel Sheet: ASTM A 1008/A 1008M, structural steel, Grade 25, unless another grade is required by design loads, exposed.

H. Uncoated, Hot Rolled Steel Sheets: ASTM A 1011/A 1011M, steel, Grade 30 unless another grade is required by design loads.

2.02 METAL STAIRS - GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.

1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.

2. Dimensions: As indicated on drawings.

3. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.

4. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.

5. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:

1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
   a. Welded Joints: Continuously welded and ground smooth and flush.
   b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
   c. Exposed Edges and Corners: Eased to small uniform radius.
   d. Metal Surfaces to be Galvanized.

2. Industrial: All joints made neatly.
   a. Welded Joints: Welded on back side wherever possible.
   b. Welds Exposed to Touch: Ground smooth.
   c. Bolts Exposed to Touch in Travel Area: No nuts or screw threads exposed to touch.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.03 METAL STAIRS WITH GRATING TREADS

A. Jointing and Finish Quality Level: Industrial, as defined above.
B. Risers: galvanized closure plate.

C. Treads: Steel bar grating.
   1. Grating Type: Welded.
   2. Bearing Bar Depth: 1 inch, minimum.
   3. Top Surface: Standard.
   6. Anchorage to Stringers: End plates welded to grating, bolted to stringers.

D. Stringers: Rolled steel channels.
   1. Stringer Depth: 12 inches.
   2. End Closure: Sheet steel of same thickness as risers welded across ends.

E. Railings: Steel pipe railings. Detail railings as indicated on drawings.

2.04 ALUMINUM FIXED SHIPS LADDERS

A. Acceptable Manufacturer: Precision Ladders, LLC, which is located at: P. O. Box 2279; Morristown, TN 37816-2279; Toll Free Tel: 800-225-7814; Tel: 423-586-2265; Fax: 423-586-2091; Email: request info (info@PrecisionLadders.com); Web: www.PrecisionLadders.com

   1. Aluminum Fixed Ships Ladder SL-04 as manufactured by Precision Ladders LLC.
   2. Capacity: Unit shall support a 1000 lb (680 Kg) loading without failure, and individual treads shall withstand a 1,000 lb (1361 Kg) loading without failure.
   3. Performance Standard: Units shall be designed and manufactured to meet or exceed ANSI A14.3 and OSHA 1910.27.

C. Components:
   1. Ladder Stringer: 5 inch by 2 inch by 3/16 inch (64 mm by 27 mm by 3 mm) extruded 6005-T5 aluminum channel. Pitch: 60 degrees.
   2. Ladder Tread: 5 3/16" inch by 1 1/8 inch by 1/8 inch (57 mm by 19 mm by 6 mm) extruded 6005-T5 aluminum with deeply serrated top surface. Ladder and tread width 36 inches.
   3. Ladder Mounting Bracket: 8-1/2 inch by 2 inch by 3 inch by 1/4 inch thick (216 mm by 51 mm by 76 mm by 6 mm) aluminum angle.
   4. Railings:
      a. 1 1/4" schedule 40, 6005-T5 aluminum pipe with internal aluminum fittings.
   5. Rest Platform:
      a. Material: Ladder tread material.
      b. Platform Size: 36 inches by 48 inches (762 mm by 1219 mm) standard.
      c. Toe Boards. 6005 T-5 aluminum.
      d. Handrails: 1-1/4 inches (32 mm) aluminum square tube 42 inches (1067 mm) high.
   6. Floor Brackets: Floor bracket at foot of each stringer, 3 by 2 by 1/4 inch (76 by 51 by 6 mm).

2.05 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Prime Painting: Use specified shop- and touch-up primer.
   1. Preparation of Steel: In accordance with SSPC-SP 2, Hand Tool Cleaning.
   2. Number of Coats: One.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.
3.02 INSTALLATION
   A. Install components plumb and level, accurately fitted, free from distortion or defects.
   B. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
   C. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.
   D. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.
   E. Obtain approval prior to site cutting or creating adjustments not scheduled.
   F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.03 TOLERANCES
   A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
   B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION
SECTION 05 5213
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted handrails.
B. Stair railings and guardrails.
C. Balcony railings and guardrails.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Placement of anchors in concrete.
B. Section 05 5100 - Metal Stairs: Attachment plates for handrails specified in this section.

1.03 REFERENCE STANDARDS

C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
C. Submit design calculations for railing assemblies.
D. LEED Submittal:
   1. MR Credit 2: Construction Waste Management: For products being recycled, documentation of total weight of project waste diverted from landfill.
   2. Product Data for Credit MR4.1 and Credit MR4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.
B. Design railing assembly, wall rails, and attachments to resist lateral force per IBC requirements.
C. Allow for expansion and contraction of members and building movement without damage to connections or members.
D. Dimensions: See drawings for configurations and heights.
E. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
F. Provide slip-on non-weld mechanical fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM
   A. Steel Pipe: ASTM A 53/A 53M, Grade B Schedule 40, galvanized finish.
   B. Non-Weld Mechanical Fittings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.
   C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
   D. Exposed Fasteners: No exposed bolts or screws.

2.03 FABRICATION
   A. Accurately form components to suit specific project conditions and for proper connection to building structure.
   B. Fit and shop assemble components in largest practical sizes for delivery to site.
   C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
   D. Welded Joints:
      1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
      2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
      3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION
3.01 EXAMINATION
   A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION
   A. Clean and strip primed steel items to bare metal where site welding is required.
   B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.03 INSTALLATION
   A. Install in accordance with manufacturer's instructions.
   B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
   C. Anchor railings securely to structure.

3.04 TOLERANCES
   A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.
   B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION
PART 1 GENERAL
1.01 SECTION INCLUDES
   A. Lighted Handrail Assembly.

1.02 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Manufacturer's data sheets on each product to be used, including:
      1. Preparation instructions and recommendations.
      2. Storage and handling requirements and recommendations
      3. Installation instructions and methods
      4. Description of materials, components, fabrication, and finishes
   C. Shop Drawings: Submit manufacturer's shop drawings, including plans, elevations, sections, and details, indicating materials, components, sizes, dimensions, tolerances, hardware, finishes, options, accessories, and installation. Show details of attaching railing system to supports.
   D. Maintenance Instructions: Submit manufacturer's maintenance and cleaning instructions.

PART 2 PRODUCTS
2.01 MANUFACTURERS
   A. Decorative Metal Railings:
      1. Atlantis Rail System; www.atlantisrail.com
      2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 RAILING SYSTEMS
   A. SunRail™ AccessEasy System: Pre-engineered, component-based, stainless steel handrail, and posts ornamental railing system.
      1. Posts: Stainless steel structural Tube, 2-inch (50 mm) diameter, Type 316 stainless steel, 4 foot (1219 mm) O.C. maximum.
      2. Handrail: Stainless steel structural tubing, 1-1/2 inch (38 mm) diameter, Type 316 stainless steel. Attached to 2 inch (50 mm) posts with specified connectors and appropriate spacing to comply with ADA Standards.
      3. Stainless Steel Finish:
         a. Polished.
      4. Electrical Components: Micro Star LED Lighting; LEDs encased in Type 316 stainless steel housings; 1/4-inch (6 mm) diameter by 7/8-inch (22 mm) long installed in railings.

PART 3 EXECUTION
3.01 PREPARATION
   A. Take field measurements after permanent end terminations are in place and prior to preparation of shop drawings and fabrication, to ensure fitting of work.
   B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.02 INSTALLATION
   A. Install railing system in accordance with manufacturer's instructions.
   B. Install railing system plumb, level, square, true to line, and rigid.
   C. Attach railing system securely in place using fasteners supplied or approved by manufacturer. Embedded anchor plates and supporting steel shall be provided by another trade and coordinated with the railing supplier.
   D. Attach railing system to supports approved by manufacturer.
E. Install LED lighting components in accordance with manufacturer's instructions.

3.03 CLEANING
A. Remove temporary coverings and protection of adjacent work areas.
B. Clean railing system promptly after installation in accordance with manufacturer's instructions.
C. Do not use harsh cleaning materials or methods that would damage glass or finish
D. Do not use abrasive cleaners.

3.04 PROTECTION
A. Protect installed components and finishes from damage after installation.

END OF SECTION
SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Roof-mounted curbs.
   B. Preservative treated wood materials.
   C. Fire retardant treated wood materials.
   D. Communications and electrical room mounting boards.
   E. Concealed wood blocking, nailers, and supports.
   F. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS
   A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
   B. Section 05 1200 - Structural Steel Framing: Prefabricated beams and columns for support of wood framing.

1.03 REFERENCE STANDARDS
   C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
   H. PS 1 - Structural Plywood; 2009.
   J. WWPA G-5 - Western Lumber Grading Rules; 2011.

1.04 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. MR Credit 2: Construction Waste Management: For products being recycled, documentation of total weight of project waste diverted from landfill.
   C. LEED Submittal: Submit applicable LEED Submittal form for each different product made of locally-sourced wood.
      1. Provide product data indicating where the wood was harvested, milled and manufactured.
      2. Provide product data for any manufactured wood products certifying that the product has no added urea-formaldehyde resins.
      3. Provide VOC product data for any manufactured wood products used on the interior of the building.
   D. For all wood products designated in this specification as "FSC Certified", provide evidence of compliance with FSC standards as follows:
      1. Demonstrate that products are FSC certified by providing vendor invoices. Invoices will contain the vendor's Chain-of-Custody (COC) number and identify each FSC certified product on line-item basis. A "vendor" is defined as the company that furnishes wood products to project contractors and/or subcontractors for on-site installation.
2. Wood products without submittal of acceptable documentation will be rejected.

E. Wood shall be fire treated as required.

1.05 QUALITY ASSURANCE

A. All wood products designated as "FSC Certified" in this specification shall be certified according to the rules of the Forest Stewardship Council (www.fscus.org).

B. The following North American certified bodies are accredited by the FSC to certify forest products:
   1. Scientific Certification Systems; www.scscertified.com
   3. SGS Qualifor; www.qualifor.com
   4. Soil Association; www.soilassociation.org

1.06 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

2.01 SUPPLIER LOCATIONS

   1. Retail/Contractor Sales
   2. Certification:
      a. Program: FSC
      b. Certification: Chain-of-Custody
      c. Certification #: SCS-COC-001211

B. Boise Cascade, LLC; www.boisecascade.com; Boise, Idaho 83702.
   1. Retail/Contractor Sales
   2. Certification:
      a. Program: FSC
      b. Certification: Chain-of-Custody
      c. Certification #: SW-COC-003541
      d. Certification Body: Smartwood Program.

2.02 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: Douglas Fir-Larch, unless otherwise indicated.
   2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
   3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
   4. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

B. Lumber fabricated from old growth timber is not permitted.

C. Provide sustainably harvested wood; see Section 01 6000 - Product Requirements for requirements.

D. Provide wood harvested within a 500 mile radius of the project site.

2.03 DIMENSION LUMBER

A. Grading Agency: Western Wood Products Association (WWPA).

B. Sizes: Nominal sizes as indicated on drawings, S4S.
C. Moisture Content: S-dry or MC19.

D. Stud Framing (2 by 2 through 2 by 6):
   2. Grade: as indicated on drawings.

E. All wood used in contact with concrete will be pressure treated.

F. Roof nailers, roof coping sub-framing, roof curb nailers:
   1. Lumber S4S, No. 2 or better grade.
   2. Pressure treated.
   3. Verify lumber requirements with roofing manufacturer requirements. Most stringent requirements apply.

G. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.04 CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, fire treated; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.05 ACCESSORIES

A. Fasteners and Anchors:
   2. Anchors: Bolt or ballistic fastener for anchorages to steel.

2.06 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
E. Provide the following specific non-structural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.
   7. Chalkboards and marker boards.
   8. Wall paneling and trim.
   9. Joints of rigid wall coverings that occur between studs.

3.04 INSTALLATION OF CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.

END OF SECTION
SECTION 07 1113
BITUMINOUS DAMPPROOFING

PART 1 GENERAL
1.01 SECTION INCLUDES
A. Bituminous dampproofing.

1.02 RELATED REQUIREMENTS
A. Section 31 2323 - Fill.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide properties of primer, bitumen, and mastics.
C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
D. LEED Report: Submit for products that meet VOC content limits of 500 g/L for bituminous coatings and mastics as required by the U.S. EPA Architectural Coating rule.

1.05 QUALITY ASSURANCE
A. Deliver materials to site in manufacturer's original, unopened containers and packaging with labels clearly identifying product name and manufacturer.
B. Store materials in a clean dry area in accordance with manufacturer's instructions.
C. Store in temperatures of 40 degrees F and above to facilitate handling.
D. Do not store at temperatures above 90 degrees F for extended periods.
E. Keep away from sparks and flames.
F. Protect materials during handling and application to prevent damage or contamination.

1.06 FIELD CONDITIONS
A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until dampproofing has cured.

PART 2 PRODUCTS
2.01 MANUFACTURERS
A. Acceptable Manufacturers:
   4. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify existing conditions before starting work.
B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.
C. Verify that items that penetrate surfaces to receive dampproofing are securely installed.

3.02 PREPARATION
A. Protect adjacent surfaces not designated to receive dampproofing.
B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.
C. Do not apply dampproofing to surfaces unacceptable to manufacturer.
D. Apply mastic to seal penetrations, small cracks, or minor honeycomb in substrate.

3.03 APPLICATION
A. Perform work in accordance with NRCA Roofing and Waterproofing Manual.
B. Apply bitumen with roller. Minimum two coats.
C. Apply from 2 inches below finish grade elevation down to top of footings.
D. Seal items projecting through dampproofing surface with mastic. Seal watertight.
E. Immediately backfill against dampproofing to protect from damage.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
A. Below grade waterproofing and dampproofing.

1.02 RELATED REQUIREMENTS
A. Section 07 11 13 - Bituminous Dampproofing.
B. Section 31 223 16 - Excavation.
C. Section 31 23 23 - Fill: Backfilling.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Specimen warranty.
C. Test Reports: Evaluation service reports or other independent testing agency reports showing compliance with specified requirements.
D. Installer Qualifications: Include minimum of 5 project references.
E. Executed warranty.
F. Warranty: Submit manufacturer warranty and ensure forms have been completed in MSU Facilities's name and registered with manufacturer.

1.05 QUALITY ASSURANCE
A. Installer Qualifications: Company specializing in performing work of this type and approved by the membrane manufacturer.
B. Manufacturer's Field Services: Provide the services of a representative accredited by the sheet manufacturer to examine substrates before starting installation, periodically review installation procedures, and review final installed systems.

1.06 DELIVERY, STORAGE, AND PROTECTION
A. Deliver products to project site in original packaging with labels intact.
B. Store products in manner acceptable to membrane manufacturer.
C. When products must be stored for extended periods, keep out of direct sunlight and at temperatures above minus 20 degrees F (minus 30 degrees C).
D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 WARRANTY
A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
B. Manufacturer’s Limited Product Warranty.

PART 2 PRODUCTS
2.01 MANUFACTURERS
A. All Products of This Section:
   1. Tremco Barrier Solutions; www.tremcobarriersolutions.com
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 APPLICATIONS
A. Foundation Wall Waterproofing or dampproofing: Install membrane to all walls below grade, from bottom of wall to grade level, and in locations indicated on the drawings.

2.03 MATERIALS
A. Foundation Wall Waterproofing or dampproofing Membrane: Polymer-Enhanced Asphalt Liquid-Applied Membrane.
   1. Product: Watchdog H3
      a. Color: Black.
      b. Solids: 64% +/- 3% (percent by weight).
      c. Density: 8.2 +/- .1 lbs/gal.
      e. Application Temperature: Minimum 20 Degrees F.
      f. Application Thickness: 60 mils (wet).
      g. Cure Time: 16-24 hrs.
      h. Adhesion to Concrete: ASTM C-836.
      i. Elongation: >1800 per ASTM D-412.
      k. Water Vapor Absorption: <1 perm, ASTM E-96.
      a. Type: Polypropylene body with needle punched nonwoven monofilament.
      b. Size: roll 4' x 50'
      c. Thickness: 0.44 inches.
      d. Water flow rate: 165 gpm/foot square
      e. Tensile strength: 100 per D4632
      f. Core compressive strength: 15,000 psf per D1621
      g. Recycled content: 77%
      h. Core flow rate: 17 gpm/ foot square.
B. Accessories as recommended by product manufacturer’s installation instructions.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that substrates are sound enough to retain fasteners and suitable for bonding of sealant.
B. Verify that there are no active leaks within area to be covered.
C. Verify that perimeter foundation drainage system has been properly installed.
D. Verify that finish grade elevations are clearly marked.
E. Do not begin installation until substrates have been properly prepared.
F. If substrate preparation is the responsibility of another trade, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION
A. Clean surfaces "broom clean" prior to installation.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
   1. Remove projections larger than 1/4 inch (6 mm); remove sharp edges.
   2. In concrete and masonry, patch cracks and holes so that they provide suitable substrate as recommended by membrane manufacturer.
C. Mark a chalk line at anticipated grade level on walls prior to starting installation.

3.03 WATERPROOFING INSTALLATION
A. Install in accordance with manufacturer's recommended procedure.
B. Do not install when:
   1. Concrete has been cured for less than 3 days.
   2. Standing water is present.

3.04 FIELD QUALITY CONTROL
A. Provide the services of a manufacturer's representative to inspect substrates for suitability for installation, to review procedures during construction, and to review the finished work.

3.05 PROTECTION
A. Do not leave installed membrane exposed to sunlight for more than 30 days after installation; to cover, complete backfill operation or cover with protection board.
B. Prior to backfilling, inspect DELTA®-MS for tears and other damage and repair.
C. Take care when backfilling to avoid damage to membrane; replace membrane damaged during backfilling.
D. Protect installed products until completion of project.
E. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation and integral vapor retarder at cavity wall construction, perimeter foundation wall, underside of floor slabs, and exterior wall behind metal and brick wall finish.

B. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: Board insulation as wall sheathing.

B. Section 07 2119 - Foamed-In-Place Insulation: Plastic foam insulation other than boards.

C. Section 07 2500 - Weather Barriers: Separate air barrier and vapor retarder materials.

D. Section 09 2116 - Gypsum Board Assemblies: Acoustic insulation inside walls and partitions.

1.03 REFERENCE STANDARDS


G. Leadership in Energy and Environmental Design: LEED
   1. Materials and Resources (MR) Credit 4.1 - Recycled Content 5%.
   2. Materials and Resources (MR) Credit 4.2 - Recycled Content 10%.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. LEED Submittal: Provide documentation indicating how the requirements of Credit 4.1 and 4.2 will be met.
   1. List of proposed materials with recycled content. Indicate post-consumer recycled content and pre-consumer recycled content for each product having recycled content.
   2. Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content.
   3. Product Data for Credit: For products with low VOC emission certified by GreenGuard Environmental Institute.

1.05 SYSTEM DESCRIPTION

A. Design Requirements: Provide products that have been manufactured, fabricated and installed to the following criteria:
   1. Fire-Test-response Characteristics: provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test methods indicated below or other testing and inspecting agency acceptable to
authorities having jurisdiction. Identify materials with appropriate markings of applicable
testing and inspecting agency.
   a. Surface Burning Characteristics (ASTM E84).

B. Performance Requirements: Provide products that have been manufactured, fabricated and
installed to the following criteria:
1. Surface Burning Characteristics, unfaced (ASTM E84): Flamespread index 25, smoke
development 50.
2. Recycled Glass Content: 25%.

1.06 QUALITY ASSURANCE
A. Obtain each type of building insulation through a single source.
B. Installer Qualification: Utilize an installer having demonstrated experience on projects of similar
size and complexity.

PART 2 PRODUCTS
2.01 MANUFACTURERS
A. Insulation:
   7. Urethane Technology Co; www.urethanetechnology.com
   8. Dow; www.building.dow.com
   9. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FORMALDEHYDE-FREE BUILDING INSULATION
A. JM Formaldehyde-Free Unfaced batts
   3. Critical Radiant Flux (ASTM E970): Greater than 0.11 btu/ft2 x s(0.12 W/cm2).
   4. Water Vapor Sorption (ASTM C1104): 5% or less.
   5. Odor Emission (ASTM C1304): Pass
   8. Recycled Content: Certified by Scientific Certification Systems contain minimum of 20%
post-consumer and 5% pre-consumer recycled glass product, on a average of
manufacturer's products.
   9. Prove through documentation that products complies with CIWMB Section 01 5712 for
indoor air quality.
   10. Thickness: See drawings.

2.03 FOAM BOARD INSULATION MATERIALS
A. Extruded Polystyrene Board Insulation: Extruded polystyrene board; ASTM C578; with either
natural skin or cut cell surfaces, and the following characteristics:
1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
3. R-value: 1 inch of material at 72 degrees F: 5, minimum.
4. Board Size: 48 x 96 inch.
5. Board thickness: See drawings.
7. Thermal Conductivity (k factor) at 25 degrees F: 0.18.
10. Water Absorption, Maximum: 0.3 percent, by volume.
11. Manufacturers:
12. Substitutions: See Section 01 6000 - Product Requirements.

B. Extruded Polystyrene Board Insulation with nailers: Extruded polystyrene board; ASTM C578; with either natural skin or cut cell surfaces, including factory installed wood nailers, and the following characteristics:
1. Flame Spread: 25 or less.
2. Smoke Developed: 450 or less, ASTM E84
3. Thickness: 3 1/2"
4. R Value: 14.6 at 40 degrees
5. Edges: square
7. Raceways: provide electrical raceways at 18” and 48” continuous horizontal. Provide vertical raceway each 12’ and on either side of windows or other openings.
8. Manufacturer: Big Sky Insulation, Foam Control Nailstrip or equal.

C. Polyisocyanurate Board Insulation with Facers Both Sides: Rigid cellular foam, complying with ASTM C1289; Type I, aluminum foil both faces; Class 1, non-reinforced foam core.
1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
3. Compressive Strength: 20 psi
5. Board Thickness: 1.5 inch.
7. Manufacturers:
   b. Carlisle Coatings & Waterproofing, Inc; R2+ Silver: www.carlisleccw.com/sle.
8. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

A. Sheet Vapor Retarder: Black polyethylene film for above grade application, 10 mil thick.
B. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch wide.
C. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.
D. Adhesive: Type recommended by insulation manufacturer for application.
PART 3 EXECUTION

3.01 EXAMINATION
A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 PREPARATION
A. Protection: Protect adjacent work areas and finish surfaces from damage during product installation.

3.03 INSTALLATION
A. General: Comply with insulation manufacturer's written instructions applicable to products and application indicated.
   1. Install insulation that is undamaged, dry and unsoiled and that has not been left exposed at anytime to ice and snow.
   2. Extend insulation in thickness indicated to envelope entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
   3. Water Piping Coordination: If water piping is located on the inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
   4. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.
B. Installation of General Building Insulation:
   1. Seal joints between closed cell (non-breathing) insulation units by applying adhesive, mastic or sealant to edges of each unit to form a tight seal as units are shoved in place. Fill voids in completed installation with adhesive, mastic or sealant as recommended by insulation manufacturer.
   2. Set vapor retarder faced units with vapor retarder to warm side of construction unless otherwise indicated. Do not obstruct ventilation spaces except for firestopping.
      a. Tape ruptures in vapor retarder and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
   3. Install glass-fiber blankets in cavities formed by framing members according to the following requirements:
      a. Use blanket widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
      b. Place blankets in cavities formed by framing members to produce friction fit between edges of insulation and adjoining framing members.
      c. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping stapling flanges to flanges of metal studs.
   4. Wood Framed Construction: Install mineral-fiber blankets in accordance with ASTM C1320 and as follows:
      a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to produce airtight installation after concealing finish materials is in place.
   6. Board Insulation Installation: Install insulation where indicated:
      a. Cut and friction fit insulation between vertical or Z-shaped framing.
      b. Alternatively install insulation on impaling pins or with suitable adhesives.
      c. Place pins 3 inches - 5 inches from edge of insulation.
7. Loose-Fill Insulation: Place loose fill insulation into spaces and onto surfaces as shown, either by pouring or by machine blowing to comply with ASTM C1015. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density but not compact excessively.
   a. Stuff glass-fiber, loose fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40% of normal maximum volume equaling a density of approximately 2.5 pcf (40 kg/M³).

C. Installation of Vapor Retarders:
   1. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates including those filled with loose-fiber insulation.
   2. Seal vertical joints in vapor retarders over framing by lapping not less than 2 wall studs. Fasten vapor retarders to framing at top, end and bottom edges, at perimeter of wall openings; and at lap joints. Space fasteners 16 inches O.C.
   3. Seal overlapping joints in vapor retarders with adhesives or vapor retarder tape according to vapor retarder manufacturer’s instructions. Seal butt joints and fastener penetrations with vapor retarder tape. Locate all joints over framing members or other solid substrates.
   4. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor retarder manufacturer.
   5. Seal joints caused by pipes, conduits, electrical boxes and similar items penetrating vapor retarders with vapor retarder tape to create an airtight seal between penetrating objects and vapor retarder.

3.04 BOARD INSTALLATION AT FOUNDATION PERIMETER
   A. Adhere a 6 inch wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
      1. Tape seal joints.
      2. Extend sheet full height of joint.
   B. Apply adhesive to back of boards:
   C. Install boards horizontally on foundation perimeter.
      1. Place boards to maximize adhesive contact.
      2. Install in running bond pattern.
      3. Butt edges and ends tightly to adjacent boards and to protrusions.
   D. Extend boards over expansion joints, unbonded to foundation on one side of joint.
   E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
   F. Immediately following application of board insulation, place protective boards over exposed insulation surfaces.
      1. Install boards horizontally from base of foundation to top of insulation.
      2. Butt boards tightly, with joints staggered from insulation joints.

3.05 BOARD INSTALLATION AT EXTERIOR WALLS
   A. Adhere a 6 inch wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
      1. Tape seal joints between sheets.
      2. Extend sheet full height of joint.
   B. Install boards horizontally on walls.
      1. Place boards to maximize adhesive contact.
      2. Butt edges and ends tightly to adjacent boards and to protrusions.
   C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
   D. Place 6 inch wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window and door frames. Tape seal in place to ensure continuity of vapor retarder and air seal.
3.06 BOARD INSTALLATION AT CAVITY WALLS

A. Secure impale fasteners to substrate at a frequency as follows:
   1. 6 per insulation board.

B. Adhere a 6 inch wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
   1. Tape seal joints between sheets.
   2. Extend sheet full height of joint.

C. Apply adhesive to back of boards:

D. Install boards to fit snugly between wall ties.
   1. Place membrane surface against adhesive.

E. Install boards horizontally on walls.
   1. Place boards to maximize adhesive contact.
   2. Butt edges and ends tightly to adjacent boards and to protrusions.
   3. Place impale fastener locking discs.

F. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

G. Place 6 inch wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window and door frames. Tape seal in place to ensure continuity of vapor retarder and air seal.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES

A. Foamed-in-place insulation below Northwest entry landing deck with thermal fire barrier
B. Foamed-in-place insulation below deck at east side mezzanine level outdoor deck with thermal fire barrier.
C. Foamed-in-place insulation in miscellaneous cavities of junctions between multiple components to achieve a thermal and air seal.
D. Foamed-in-place insulation at junctions of dissimilar wall and roof materials to achieve a thermal and air seal, with protective overcoat.

1.02 REFERENCE STANDARDS


1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements.
C. Certified Test Reports: With product data, submit copies of certified test reports showing compliance with specified performance values, including R-Values, fire performance and sound abatement characteristics.
E. Manufacturer’s Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.
F. Certificates: Certify that products of this section meet or exceed specified requirements.
G. LEED Submittal: Provide documentation that product passes CIWMB for indoor air quality.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.
B. Applicator Qualifications: Company specializing in performing work of the type specified, with minimum three years documented experience.
C. Fire Performance Characteristics: provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by a testing agency acceptable to authorities having jurisdiction.
PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Foamed-In-Place Insulation:
   6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS
A. Foamed-In-Place Insulation: Low-density, flexible, open celled, water vapor permeable polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
   1. Aged Thermal Resistance: R-value of 3 (deg F hr sq ft)/Btu, minimum, when tested at 1 inch thickness in accordance with ASTM C518 after aging for 180 days at 41 degrees F.
   2. Required thermal performance:
      a. Northwest exit landing below deck: R-30 with 20 minute thermal fire barrier.
      b. Mezzanine level east outdoor deck below metal deck: R-20 with 20 minute thermal fire barrier.
      c. Misc. Locations at junctions, deck flutes etc. - provide 2" minimum thickness if space allows. In smaller areas, fill entire cavity.
   3. Air Permeance: 0.004 cfm/sq ft, maximum, when tested at intended thickness in accordance with ASTM E2178 or ASTM E283 at 1.5 psf.
   4. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
   6. Products:
      e. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify work within construction spaces or crevices is complete prior to insulation application.
B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation or overcoat adhesion.

3.02 PREPARATION
A. Mask and protect adjacent surfaces from over spray or dusting.
B. Apply primer in accordance with manufacturer's instructions.

3.03 FOAM-IN-PLACE INSULATION APPLICATION
A. Apply insulation in accordance with manufacturer's instructions.
B. Apply to a minimum cured thickness of 4 inch.
C. Apply overcoat monolithically, without voids to fully cover foam insulation, to achieve fire rating required.
D. Patch damaged areas.
3.04 FOAM-IN-PLACE MASONRY INSULATION APPLICATION
   A. General: Install foamed in place insulation from interior or as specified, prior to installation of
      interior finish work and after all masonry and structural concrete work is in place, comply with
      manufacturer’s instructions.

3.05 PROTECTION
   A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION
SECTION 07 2500
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Weather barrier membrane (DuPont Tyvek Commercial Wrap).
B. Seam Tape (DuPont Tyvek Tape).
C. Flashing (DuPont FlexWrap, DuPont FlexWrap NF, DuPont StraightFlash, DuPont StraightFlash VF, and/or DuPont Thru-Wall Flashing).
D. Fasteners (DuPont Tyvek Wrap Caps).
E. Weather Barrier for rainscreen wall at A606 (Corten) panel wall system: see 07 4213.50 Flat Metal Wall Panels.

1.02 RELATED REQUIREMENTS
A. Section 05 4000 - Cold-Formed Metal Framing: Water-resistive barrier under exterior cladding.
B. Section 06 1000 - Rough Carpentry: Water-resistive barrier under exterior cladding.
C. Section 07 2100 - Thermal Insulation: Vapor retarder installed in conjunction with batt insulation.
D. Section 07 5400 - Thermoplastic Membrane Roofing: Vapor retarder installed as part of roofing system.
E. Section 07 9005 - Joint Sealers: Sealant materials and installation techniques.
F. Section 09 2116 - Gypsum Board Assemblies: Water-resistive barrier under exterior cladding.

1.03 DEFINITIONS
A. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.
B. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
1. Water Vapor Permeance: For purposes of conversion, 57.2 ng/(Pa s sq m) = 1 perm.

1.04 REFERENCE STANDARDS

1.05 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on material characteristics.
C. Samples: Weather Barrier Membrane, minimum 8-1/2 inches x 11 inches.
D. Manufacturer's Installation Instructions: Indicate preparation.

PART 2 PRODUCTS

2.01 MANUFACTURER
A. DuPont; 4417 Lancaster Pike, Chestnut Run Plaza, Wilmington, DE 19805; 1-800-44-TYVEK; www.tyvek.com.
B. Substitutions: See Section 01 6000 - Product Requirements.
2.02 MATERIALS

A. Basis of Design: Spunbonded polyolefin, non-woven, non-perforated, weather barrier is based upon DuPont Tyvek CommercialWrap and related assembly components.

B. Performance Characteristics:
   1. Air Penetration: 0.001 cfm/ft² at 75 Pa, when tested in accordance with ASTM E2178. Type I per ASTM E1677. <0.04 cfm/ft² at 75 Pa, when tested in accordance with ASTM E2357.
   2. Water Vapor Transmission: 28 perms, when tested in accordance with ASTM E96, Method B.
   3. Water Penetration Resistance: 280 perms, when tested in accordance with AATCC Test Method 127.
   4. Basis Weight: 2.7 oz/yd², when tested in accordance with TAPPI Test Method T-410.
   5. Air Resistance: Air Infiltration at >1500 seconds, when tested in accordance with TAPPI Test Method T-460.
   6. Tensile Strength: 38/35 lbs/in., when tested in accordance with ASTM D882, Method A.
   7. Tear Resistance: 12/10 lbs., when tested in accordance with ASTM D1117.

C. Interior Vapor Retarder:
   1. On inside face of studs of exterior walls, under cladding, use mechanically fastened vapor retarder sheet. 10 mil.

2.03 ACCESSORIES

A. Seam Tape: 3 inch wide, DuPont Tyvek Tape for commercial applications.

B. Fasteners: DuPont Tyvek Wrap Cap Screws, as distributed by DuPont: 1-5/8 inch rust resistant screw with 2 inch diameter plastic cap or manufacturer approved 1-1/4 inch or 2 inch metal gasketed washer.

C. Sealants:
   1. Refer to Section 07 9005 Joint Sealants.

D. Flashings:
   1. DuPont FlexWrap, as distributed by DuPont: flexible membrane flashing materials for window openings and penetrations.
   2. DuPont StraightFlash, as distributed by DuPont: straight flashing membrane materials for flashing windows and doors and sealing penetrations such as masonry ties, etc.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.03 INSTALLATION - VAPOR BARRIER

A. Install materials in accordance with manufacturer's instructions.

B. Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Mechanically Fastened Sheets - Vapor Retarder On Interior:
   1. When insulation is to be installed in assembly, install vapor retarder over insulation.
   2. Seal seams, laps, perimeter edges, penetrations, tears, and cuts with self-adhesive tape, making air tight seal.
3. Locate laps at a framing member; at laps fasten one sheet to framing member then tape overlapping sheet to first sheet.
4. Seal entire perimeter to structure, window and door frames, and other penetrations.
5. Where conduit, pipes, wires, ducts, outlet boxes, and other items are installed in insulation cavity, pass vapor retarder sheet behind item but over insulation and maintain air tight seal.

### 3.04 INSTALLATION - WEATHER BARRIER

A. Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.
B. Install weather barrier prior to installation of windows and doors.
C. Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.
D. Install weather barrier in a horizontal manner starting at the lower portion of the wall surface with subsequent layers installed in a shingling manner to overlap lower layers. Maintain weather barrier plumb and level.
E. Sill Plate Interface: Extend lower edge of weather barrier over sill plate interface 3-6 inches. Secure to foundation with elastomeric sealant as recommended by weather barrier manufacturer.
F. Window and Door Openings: Extend weather barrier completely over openings.
G. Overlap Weather Barrier:
   1. Exterior Corners: Minimum 12 inches.
   2. Seams: Minimum 6 inches.
H. Weather Barrier Attachment:
   1. Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommended fasteners, space 12-18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.

### 3.05 SEAMING

A. Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.
B. Seal any tears or cuts as recommended by weather barrier manufacturer.

### 3.06 OPENING PREPARATION

A. Flush cut weather barrier at edge of sheathing around full perimeter of opening.
B. Cut a head flap at 45 degree angle in the weather barrier at window head to expose 8 inches of sheathing. Temporarily secure weather barrier flap away from sheathing with tape.

### 3.07 FLASHING

A. Cut 7 inch wide DuPont FlexWrap a minimum of 12 inches longer than width of sill rough opening. Apply primer as required by manufacturer.
B. Cover horizontal sill by aligning DuPont FlexWrap edge with inside edge of sill. Adhere to rough opening across sill and up jambs a minimum of 6 inches. Secure flashing tightly into corners by working in along the sill before adhering up the jambs.
C. Fan DuPont FlexWrap at bottom corners into face of wall. Firmly press in place. Mechanically fasten fanned edges. Mechanical fastening is not required for DuPont FlexWrap NF.
D. Apply 9-inch wide strips of DuPont StraightFlash at jambs. Align flashing with interior edge of jamb framing. Start DuPont StraightFlash at head of opening and lap sill flashing down to the sill.
E. Spray-apply primer to top 6 inches of jambs and exposed sheathing.
F. Instal DuPont FlexWrap at opening head using same installation procedures used at sill. Overlap jamb flashing a minimum of 2 inches.
G. Coordinate flashing with window installation.
H. On exterior, install backer-rod in joint between window frame and flashed rough framing. Apply sealant at jambs and head, leaving sill unsealed. Apply sealants in accordance with sealant manufacturer's instructions and ASTM C 1193.

I. Position weather barrier head flap across head flashing. Adhere using 4 inch wide DuPont StraightFlash over the 45 degree seams.

J. Tape top of window in accordance with manufacturer recommendations.

3.08 THRU-WALL FLASHING/WEATHER BARRIER INTERFACE AT WIDOW HEAD

A. Cut flap in weather barrier at window head.

B. Prime exposed sheathing.

C. Install lintel as required. verify end dams extend 4 inches minimum beyond opening.

D. Install end dams bedded in sealant.

E. Adhere 2 inches minimum thru-wall flashing to wall sheathing. Overlap lintel with thru-wall flashing and extend 1/4 inch minimum beyond outside edge of lintel to form drip edge.

F. Apply sealant along thru-wall flashing edges.

G. Fold weather barrier flap back into place and tape bottom edge of thru-wall flashing.

H. Tape diagonal cuts of weather barrier.

I. Secure weather barrier flap with fasteners.

3.09 FIELD QUALITY CONTROL

A. Do not cover installed weather barriers until required inspections have been completed.

B. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

3.10 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION
PART 1 GENERAL

1.01 SUMMARY

A. Products supplied under this section:
   1. Vapor barrier and installation accessories for installation under concrete slabs.

B. Related Sections:
   1. Section 03 30 00 Cast-in-Place Concrete

1.02 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM):
   1. ASTM E1745-11 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
   2. ASTM E1643-11 Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

B. Technical Reference - American Concrete Institute (ACI):
   1. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

1.03 SUBMITTALS

A. Quality control/assurance:
   1. Summary of test results per paragraph 9.3 of ASTM E1745.
   2. Manufacturer’s samples and literature.
   3. Manufacturer’s installation instructions for placement, seaming, penetration repair, and perimeter seal per ASTM E1643.
   4. All mandatory ASTM E1745 testing must be performed on a single production roll per ASTM E1745 Section 8.1.
   5. Contact vapor barrier manufacturer to coordinate a review of the vapor barrier installation either by digital review or in person.

PART 2 PRODUCTS

2.01 MATERIALS

A. Vapor barrier shall have all of the following qualities:
   1. Maintain permeance of less than 0.01 Perms [grains/(ft² · hr · inHg)] as tested in accordance with mandatory conditioning tests per ASTM E1745 Section 7.1 (7.1.1-7.1.5).
   2. Other performance criteria:
      a. Strength: ASTM E1745 Class A.
      b. Thickness: 15 mils minimum.
   3. Provide third party documentation that all testing was performed on a single production roll per ASTM E1745 Section 8.1.

B. Vapor barrier products:

2.02 ACCESSORIES

A. Seams:

B. Penetrations of Vapor barrier:

C. Perimeter/edge seal:
4. Sealing the perimeter with one-sided seam tape is prohibited.

PART 3 EXECUTION

3.01 PREPARATION

A. Ensure that subsoil is approved by Architect or Geotechnical Engineer.
   1. Level and compact base material.

3.02 INSTALLATION

A. Install vapor barrier in accordance ASTM E1643.
   1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
   2. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself. Seal vapor barrier to the entire perimeter wall or footing/grade beam with double sided StegoTack Tape, per manufacturer’s instructions. Ensure the concrete is clean and dry prior to adhering tape.
   3. Overlap joints 6 inches and seal with manufacturer’s seam tape.
   4. Apply seam tape/Crete Claw to a clean and dry vapor barrier.
   5. Seal all penetrations (including pipes) per manufacturer’s instructions.
   6. If non-permanent stakes are driven through vapor barrier, repair as recommended by vapor barrier manufacturer.
   7. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
A. Metal Wall Panels over Outside-Insulated Framed Wall System: Single skin concealed fastener metal wall panels applied over rigid insulation and wall framing specified in Division 05 Section "Cold Formed Metal framing" with exterior sheathing specified in Division 07 Section "thermal Insulation". Metal wall panel installation specified in this section.

1.02 RELATED REQUIREMENTS
A. Section 05 4000 - Cold-Formed Metal Framing: Wall panel substrate.
B. Section 07 2100 - Thermal Insulation.
C. Section 07 2500 - Weather Barriers: Weather barrier under wall panels.
D. Section 07 9005 - Joint Sealers.

1.03 REFERENCE STANDARDS
A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

1.04 PERFORMANCE REQUIREMENTS
A. Air Infiltration: Maximum 0.06 cfm/sq ft per ASTM E 283 at a static air-pressure difference of 1.57 lbf/ sq ft, using minimum 10 x 10 foot test panel that includes side joints.
B. Water Penetration, Static Pressure: No uncontrolled water penetration per ASTM E 331 at a minimum static differential pressure of 6.24 lbf/sq ft, using minimum 10 x 10 foot test panel that includes side joints.

1.05 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate dimensions, layout, joints, construction details, methods of anchorage.
C. Samples: Submit two samples of wall panel, 4 inch by 4 inch in size illustrating finish color, sheen, and texture.
D. LEED Submittals:
   1. MR Credit 2: Construction Waste Management: For products being recycled, documentation of total weight of project waste diverted from landfill.
   2. Product Data for MRc 4.1 and MRc 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.
   3. MR Credit 5: Local and Regional Materials: Product Data for Credit MR 5.1 and Credit MR 5.2. Submit data, including location and distance from project of material manufacturer and point of extraction, harvest or recovery for main raw material.
1.06 QUALITY ASSURANCE
   A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
   B. Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years of experience.

1.07 ADMINISTRATION REQUIREMENTS
   A. Preinstallation Meeting: Conduct preinstallation meeting at site attended by Owner, Architect, manufacturer's representative, and other trade contractors.
      1. Coordinate building framing in relation to metal wall panel assembly.
      2. Coordinate installation of building air and water barrier behind metal wall panel assembly.
      3. Coordinate window, door and louver, and other openings and penetrations of metal wall panel assembly.

1.08 DELIVERY, STORAGE, AND HANDLING
   A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
   B. Store prefinished material off ground and protected from weather. Prevent twisting, bending, or abrasion, and provide ventilation to stored materials. Slope metal sheets to ensure drainage.

1.09 WARRANTY
   A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
   B. Correct defective work within a five year period after the Date of Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.
   C. Correct defective Work within a five year period after the Date of Substantial Completion, including defects in water tightness and integrity of seals.

PART 2 PRODUCTS

2.01 MANUFACTURERS
   A. Design is based on Magna-Loc manufactured by Metal Sales, Inc..
   B. Other Acceptable Manufacturers:
      1. Metal Sales; TLC-3 Panel; www.metal sales.us.com
      2. Bridger Steel.
      3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MANUFACTURED METAL PANEL
   A. Panel: Pac-Clad Redi-Roof Standing Seam Metal Roof Panel: roof panel applied horizontally on wall surface. 18 inch panel coverage, non-striated. 1 9/16 inch panel height. Panels installed with rolled seam turned down under seam.
   B. Material: Aluminum-zinc alloy coated steel sheet, ASTM A792, Class AZ50 designation, 0.23 inch (24 gauge base thickness). Total coated thickness of 0.023 inches.
   D. Recycled content: minimum 36%, minimum 18% post-consumer.
   E. Concealed fastener clips, designed for movement.
   F. Internal and External Corners provided by wall system manufacturer: 24 ga. Same material and finish as exterior sheets; profile to match drawings; shop cut and factory mitered to required angles.
   G. Trim: All wall panel trim - same material and finish as exterior sheets; 24 ga. Brake formed to required profiles. See Section 07540 for roof flashing & trim.
   H. Anchors: Galvanized steel.
2.03 MATERIALS
   A. Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) or Forming Steel (FS), with G90/Z275 coating; continuous coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.
   B. Exterior Finish Coating: Panel manufacturer's standard polyvinylidene fluoride (PVF) top coat, over epoxy primer.
   C. Panel Back Coating: Panel manufacturer's standard polyester wash coat.

2.04 ACCESSORIES
   A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.
   B. Sealants: Shall be as recommended and supplied by panel manufacturer.
   C. Fasteners: As supplied or recommended by panel manufacturer; with soft neoprene washers, steel, hot dip galvanized. Fastener cap same color as exterior panel.
   D. Field touch-up paint as recommended by panel manufacturer.

2.05 FABRICATION
   A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
   B. Form pieces in longest practicable lengths.

2.06 FABRICATION
   A. Wall panel system components shall be fabricated in the factory for field assembly to the greatest extent possible.
   B. Fasteners: Self-tapping screws and other acceptable fasteners recommended by panel manufacturer.
   C. Sealants: Manufacturer's standard type suitable for use with installation of system; non-staining.
   D. Field Touch-up Paint: As recommended by panel manufacturer.

PART 3 EXECUTION
3.01 EXAMINATION
   A. Verify that building framing members are ready to receive panels.
   B. Verify that weather barrier has been installed over substrate completely and correctly.

3.02 METAL WALL PANEL INSTALLATION
   A. General: Install metal panels in accordance with approved shop drawings and manufacturer's recommendations. Install metal panels in orientation, sizes, and locations indicated. Anchor metal wall panels and other components securely in place. Provide for thermal and structural movement.
   B. Attach panels to metal framing using recommended clips, screws, fasteners, sealants, and adhesives indicated on approved shop drawings.
      1. Fasten metal wall panels to supports with fasteners and spacing recommended by manufacturer.
      2. Dissimilar Materials: Where elements of metal wall panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by manufacturer.
   C. Joint Sealers: Install joint sealants where indicated on approved shop drawings.

3.03 TOLERANCES
   A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.
   B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.
3.04 CLEANING
   A. Remove site cuttings from finish surfaces.
   B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal Wall Panels over Outside-Insulated Framed Wall System: Single skin exposed fastener metal wall panels applied as exterior cladding over wall framing specified in Division 05 Section "Cold Formed Metal framing" with exterior sheathing specified in Division 07 Section "thermal Insulation".

1.02 RELATED REQUIREMENTS

A. Section 07 2100 - Thermal Insulation.
B. Section 07 2500 - Weather Barriers: Weather barrier under wall panels.
C. Section 07 9005 - Joint Sealers.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate dimensions, layout, joints, construction details, methods of anchorage.
D. LEED Submittal:
   1. MR Credit 2: Construction Waste Management: For products being recycled, documentation of total weight of project waste diverted from landfill.
   2. Product Data for MRc 4.1 and MRc 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.
   3. MR Credit 5: Local and Regional Materials: Product Data for Credit MR 5.1 and Credit MR 5.2. Submit data, including location and distance from project of material manufacturer and point of extraction, harvest or recovery for main raw material.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
B. Installer Qualifications: Company specializing in performing the work of this section with minimum [3] years of experience.

1.06 ADMINISTRATION REQUIREMENTS

A. Preinstallation Meeting: Conduct preinstallation meeting at site attended by Owner, Architect, manufacturer's representative, and other trade contractors.
1. Coordinate building framing in relation to metal wall panel assembly.
2. Coordinate installation of building air and water barrier behind metal wall panel assembly.
3. Coordinate window, door and louver, and other openings and penetrations of metal wall panel assembly.

1.07 DELIVERY, STORAGE, AND HANDLING
   A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
   B. Store prefinished material off ground and protected from weather. Prevent twisting, bending, or abrasion, and provide ventilation to stored materials. Slope metal sheets to ensure drainage.

1.08 WARRANTY
   A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
   B. Correct defective work within a [two] year period after Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.
   C. Correct defective Work within a five year period after Substantial Completion, including defects in water tightness and integrity of seals.

PART 2 PRODUCTS

2.01 MANUFACTURERS
   A. Metal Sales; T10-C Panel; www.metalsales.com.
   B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MANUFACTURED METAL PANELS
   A. T10-C Wall Panel System: Preformed and prefinished metal panel system of square ribs 6" O.C. profile; 24 gage, 30" panel coverage, 1-1/2" rib height.
      1. Color: Dark Charcoal Grey
   B. Internal and External Corners provided by wall system manufacturer: 22ga. Same material and finish as exterior sheets; profile to match drawings; shop cut and factory mitered to required angles.
   C. Trim: All wall panel trim - same material and finish as exterior sheets; 22ga. Brake formed to required profiles. See Section 07540 for roof flashing & trim.
   D. Anchors: Galvanized steel.

2.03 MATERIALS
   A. Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) or Forming Steel (FS), with G90/Z275 coating; continuous coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.
   B. Exterior Finish Coating: Panel manufacturer's standard polyvinylidene fluoride (PVF) top coat, over epoxy primer.
   C. Panel Back Coating: Panel manufacturer's standard polyester wash coat.

2.04 ACCESSORIES
   A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient; ultraviolet and ozone resistant.
   B. Sealants: Shall be as recommended and supplied by panel manufacturer.
   C. Fasteners: As supplied or recommended by panel manufacturer; with soft neoprene washers, steel, hot dip galvanized. Fastener cap same color as exterior panel.
   D. Field touch-up paint as recommended by panel manufacturer.

2.05 FABRICATION
   A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
   B. Form pieces in longest practicable lengths.
PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that building framing members are ready to receive panels.
   B. Verify that weather barrier has been installed over substrate completely and correctly.

3.02 INSTALLATION
   A. Install panels on walls and soffits in accordance with manufacturer's instructions.
   B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint. Allow to dry prior to installation.
   C. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.03 TOLERANCES
   A. Maximum Offset From True Alignment Between Adjacent Members Butting or In Line: 1/16 inch.
   B. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch.

3.04 CLEANING
   A. Remove site cuttings from finish surfaces.
   B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
A. Random lengths of 11 gage flat A606 (Corten) Steel Panels over Outside-Insulated Framed Wall System: Single skin exposed fastener metal wall panels applied as exterior cladding over sub-girt system Rainscreen Attachment specified in 07 4800, wall framing specified in Division 05 Section "Cold Formed Metal framing" with exterior sheathing specified in Division 07 Section "thermal Insulation".

1.02 RELATED REQUIREMENTS
A. Section 05 4000 - Cold-Formed Metal Framing.
B. Section 07 2100 - Thermal Insulation.
C. Section 07 2500 - Weather Barrier.
D. Section 07 4800 - Rainscreen Attachment System

1.03 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate dimensions, layout, joints, construction details, methods of anchorage.
C. Panel Sample: (3) 10"x10" indicating final oxidized finishes.
D. LEED Submittal:
   1. MR Credit 2: Construction Waste Management: For products being recycled, documentation of total weight of project waste diverted from landfill.
   2. Product Data for MRc 4.1 and MRc 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.
   3. MR Credit 5: Local and Regional Materials: Product Data for Credit MR 5.1 and Credit MR 5.2. Submit data, including location and distance from project of material manufacturer and point of extraction, harvest or recovery for main raw material.

1.04 ADMINISTRATION REQUIREMENTS
A. Preinstallation Meeting: Conduct preinstallation meeting at site attended by Owner, Architect, manufacturer's representative, and other trade contractors.
   1. Coordinate building framing in relation to metal wall panel assembly.
   2. Coordinate installation of building air and water barrier behind metal wall panel assembly.
   3. Coordinate window, door and louver, and other openings and penetrations of metal wall panel assembly.

1.05 DELIVERY, STORAGE, AND HANDLING
A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
B. Store material off ground and protected from weather. Prevent twisting, bending, or abrasion, and provide ventilation to stored materials. Slope metal sheets to ensure drainage.

PART 2 PRODUCTS

2.01 SUPPLIER
A. (A606) Corten Flat Sheets; Western States Metal Roofing.
   1. Alan Bendawald; alan@metaldeck.com

2.02 MATERIALS
A. Corten Flat Sheets.
   2. Sizes: See drawings.
3. Cold-Rolled Steel Sheets.
5. Cold-Rolled shall be finish:
   a. Type 1: naturally oxidized finish. Applied oil retarder applied at bright orange phase of oxidation.
   b. Type 2: naturally oxidized finish. Applied oil retarder applied at medium orange phase of oxidation.
   c. Type 3: naturally oxidized finish. Applied oil retarder applied at dark orange phase of oxidation.

2.03 ACCESSORIES
   A. Fasteners: Ceramic coated fasteners as shown on drawings.
   B. Sub-framing: Rainscreen Attachment system as specified in 07 4800.
   C. Weather Barrier: Vapro Shield RevealShield self adhered vapor permeable membrane.
      1. Nominal thickness: 18.9 mil
      2. Water Vapor Permeability: ASTM E96: 40 grains/hour/sf
      3. Water Vapor Transmission: ASTM E398: 511.93 g/m²*24 hour

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that building framing members are ready to receive panels.
   B. Verify that weather barrier has been installed over substrate completely and correctly.
   C. Verify the Rainscreen Attachment System is installed correctly.

END OF SECTION
SECTION 07 4264
WOOD GRAIN ALUMINUM SOFFIT

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Aluminum Soffits.
   B. Aluminum trim and accessories.

1.02 RELATED REQUIREMENTS
   A. Section 05 4000 - Cold-Formed Metal Framing: Panel support framing.
   B. Section 07 2500 - Weather Barriers: Weather barrier behind rainscreen wall system.
   C. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashing components integrated with this wall system.
   D. Section 07 9005 - Joint Sealers.

1.03 REFERENCE STANDARDS
   A. ASTM D 958 - Practice for Determining Temperatures of Standard ASTM molds for Test Specimens of Plastics.

1.04 PERFORMANCE REQUIREMENTS
   A. Components: Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as calculated in accordance with applicable code.
   B. Movement: Accommodate movement within system without damage to components or movement within system; movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; deflection of structural support framing.
   C. Drainage: Provide positive drainage to exterior for moisture entering or condensation occuring within panel system.
   D. Preinstallation Meeting:
      1. Owner
      2. Architect
      3. Installer

1.05 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Manufacturer's data sheets on each product to be used, including:
      1. Preparation instructions and recommendations.
      2. Storage and handling requirements and recommendations.
      3. Installation methods.
   C. Shop Drawings: Indicate dimensions, layout, joints, expansion joints, construction details, methods of anchorage, and interface with adjacent materials.
   D. LEED Submittal: Provide documentation of how the requirements of Credit will be met:
      1. MR Credit 2: Construction Waste Management: For products being recycled, documentation of total weight of project waste diverted from landfill.
2. Product Data for MRc 4.1 and MRc 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.

3. MR Credit 5: Local and Regional Materials: Product Data for Credit MR 5.1 and Credit MR 5.2. Submit data, including location and distance from project of material manufacturer and point of extraction, harvest or recovery for main raw material.

E. Selection Samples: For each finish product specified, two complete sets of color ships representing manufacturer's full range of available colors and patterns.

F. Manufacturer's Certification: Certify products meet and exceed specified requirements.

G. Closeout Submittal: Provide manufacturer maintenance instructions that include recommendations for periodic cleaning and maintenance of components.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualification: Company specializing in manufacturing products specified in this section with at least five years documented experience.

B. Installer: Company specializing in performing work of this section and approved by manufacturer.
   1. Install system in strict compliance with manufacturer's installation instructions.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and gloss are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage and Handling: Store materials in clean, dry, interior area in accordance with manufacturer's instructions.

C. Deliver panels, components, and other manufactured items without damage or deformation.

D. Protect panels during transportation, handling, and installation from weather, excessive temperatures and construction operations.

E. Handle panels in strict compliance with manufacturer's instructions and recommendations, and in a manner to prevent bending, warping, twisting, and surface damage.
   1. Store panels vertically with top of panel down, storage of panels horizontally is not permitted.

F. Store panels covered with suitable weather tight and ventilated covering.

G. Provide storage of panels to ensure dryness, with positive slope for drainage of moisture.

H. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

I. Remove strippable protective covering from aluminum panel prior to installation.

1.08 SITE CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit assembly of this Work to be performed according to manufacturer's installation instructions and warranty requirements.

B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before panel fabrication and indicate measurements on Shop Drawings.
   1. Coordinate with construction schedule.
1.09 WARRANTY
   A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
   B. Mayne Coatings Corp. limited warranty against cracking, peeling and gloss/color retention within
      the guidelines stated by the American Aluminum Manufacturer's Association (AAMA).
      1. Woodgrains: AAMA 2604 (5 year Florida) 15 year manufacture's warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS
   A. Acceptable Manufacturer: Mayne Coatings Corp., which is located at: 27575-50th Ave, Langly, BC Canada V4W OA2; www.maynecoatings.com.
   B. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS
   A. Extruded Aluminum Soffits: Longboard Wood Grain Aluminum Siding and Soffits with Aluminate
      bonded film finish is extruded aluminum with integrated venting system.
      1. 6 inch V Groove Siding and Soffit.
      2. Length: single runs from roof edge to curtain wall WITHOUT seams. Lengths vary from
         approximately 6 feet to nearly 24 feet in length. Contractor to field verify required lengths
         prior to ordering.
      3. Color: to be selected from manufacturers entire line of wood grain colors.
   B. Accessories: Prefinished aluminum. Provide with matching accessories and starter strips as
      required:
      2. Inside corner trim.
      3. Outside corner trim.
      4. Craftsman Closer Trim
      5. U Cap for mitered corner panel to panel trim.
      6. Starter strip as required

2.03 FINISHES
   A. Comply with NAAMM's - Metal Finishes Manual for Architectural and Metal Products, for
      recommendations of designating finishes.
   B. Super Durable Powder Coatings: Aluminate Premium Wood Finishes use a polyurethane
      powder coat with ink based wood grain patterns sublimated into the base powder effectively
      tattooing the powder. The combined effect creates all the aesthetic of real wood while offering
      the same environmental advantages of powder coated finishes.
      1. Wood Grained:
         a. To be chosen from manufacturer's full range of colors.

2.04 FABRICATION
   A. Prepare surfaces, pre-treat and coat components in accordance with AAMA 2604 and 2605
      Quality Standards and applicable European standards for coating material specified.
   B. Wrap and packaged coated components using methods suitable for transit and covered site
      storage without damage.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Do not begin installation until colors have been verified.
   B. Verify framing members are ready to receive panel system.
   C. If preparation is the responsibility of another installer, notify Architect of unsatisfactory
      preparation before proceeding.
3.02 PREPARATION
   A. Protect adjacent work areas and finish surfaces from damage during installation.
   B. Prepare surfaces using methods recommended by manufacturer for achieving the best result for the material under the project conditions.

3.03 INSTALLATION
   A. Install in accordance with manufacturer's installation instructions.
   B. Fasten soffit panels to structure; aligned, level and plumb.
   C. Locate joints over supports.
   D. Use concealed fasteners unless otherwise approved by Architect.
   E. Install soffits, and accessories in accordance with best practice, with all joint members plumb and true.

3.04 FIELD QUALITY CONTROL
   A. After installation of soffit panels, check entire surface for obvious flaws and defects.
   B. Replace and repair any problem areas, paying close attention to the substrate for causes of the problem.

3.05 CLEANING
   A. After application of soffits, clean as necessary to remove all fingerprints and soiled areas.
   B. Upon completion of soffit application, clean entire area, removing all scrap, packaging, and unused materials related to this work.

END OF SECTION
SECTION 07 4800
RAINSCREEN ATTACHMENT SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Provide a thermally broken, rainscreen attachment system for attachment of exterior cladding Corten Flat Panel installed over continuous exterior insulation.

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing.
B. Section 07 2100 - Thermal Insulation.
C. Section 07 2500 - Weather Barrier.

1.03 SYSTEM DESCRIPTION

A. System assembly shall include the following components from the substrate out:
   2. Weather Resistant/Air Barrier over substrate.
   3. Continuous insulation.
   4. Thermally broken rainscreen attachment system.
   5. Exterior cladding.

1.04 DESIGN REQUIREMENTS

A. Structural Design: Exterior-insulated rainscreen wall assembly capable of withstanding effects of load and stresses from dead loads, wind loads, ice loads (if applicable) as indicated on Structural General Notes on Structural Drawings, and normal thermal movement without evidence of permanent defects of assemblies or components.
   1. Thermal Movements: Provide assemblies that allow for thermal movements resulting from the following maximum ambient temperatures by preventing overstressing of components and other detrimental effects:
      a. Temperature Change (range): 120 degrees Fahrenheit ambient.

B. Performance Requirements:
   1. Rainscreen Attachment System Performance: Comply with ANSI/ASHRAE 90.1-2010 definition of continuous insulation (c.i.).
   2. No thermal bridges other than fasteners and service openings.
   3. Thermal Performance:
      a. Continuous framing profiles (including C- or Z-shaped sections or furring) penetrating insulation not allowed.
   4. Structural Performance:
      a. Wind Load Performance – Attachment system must show the following results when tested in accordance with ASTM E330-02.
         1) 90 pound per square foot negative and positive pressure held for 60 seconds, system components shall not experience failure or gross permanent distortion.
      b. Wind cycling (air pressure cycling) performance – Attachment system must show conformance to the following results when tested in accordance with ASTM E1886-05.
         1) A total of 4,500 air pressure cycles. Cycles must include 50 cycles at a maximum pressure of 90 pounds both positive and negative. Average cycle time must not be less than 3.25 seconds for both negative and positive cycles. Cladding weight supported during test must be a minimum of 11.5 pounds per square foot. No damage or deformation must be seen at end of test.
      c. Gravity load (dead load) performance – Attachment system must demonstrate resistance to deflection under shear loading, applied parallel to the wall assembly and directly to the attachment system. Testing must be conducted using calibrated equipment by an IAS accredited third party laboratory. Deflection not to exceed 0.050 inches at 150 pounds per square foot.
5. Framing Members:
   a. Test framing components to AAMA TIR- A8-[04] – Section 7.2 to determine structural performance and effective moment of inertia for each perforated component. Minimum Effective Moment of Inertia: 0.0066 in4.
   b. Localized bending stress for eccentrically loaded framing members must be evaluated with the maximum effective length of resisting element not more than 12 inches.

6. Fasteners:
   a. Minimum Safety Factor of 3 for both tension and shear values.
   b. Combined tension and shear shall be evaluated according to an interaction formula. Sum of terms shall not exceed 1.0.

1.05 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Submit manufacturer’s product literature and descriptions of testing performed on system components to indicate meeting or exceeding specified performance.
C. Shop Drawings:
   1. Submit connection details to the cladding manufacturer, showing interface of rainscreen attachment system to substrate and panels with adjacent construction.
   2. Show system installation and attachment, including fastener size and spacing.
D. LEED Submittal:
   1. MR Credit 2: Construction Waste Management: For products being recycled, documentation of total weight of project waste diverted from landfill.
   2. Product Data for MRc 4.1 and MRc 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.
   3. MR Credit 5: Local and Regional Materials: Product Data for Credit MR 5.1 and Credit MR 5.2. Submit data, including location and distance from project of material manufacturer and point of extraction, harvest or recovery for main raw material.
E. Test Reports:
   1. Test to the following standards and provide written test reports by a third party:
      a. AAMA TIR-A8-[04]: Structural Performance of Composite Thermal Barrier Framing Systems – Section 7.2.
      b. ASTM E330.
      c. ASTM E1233.
      d. Gravity load test report, performed by IAS accredited third party.
   2. Comprehensive three-dimensional thermal modeling report indicating framing systems impact on exterior insulation rated R-value.

1.06 QUALITY ASSURANCE
A. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.
B. Pre-Installation Meeting:
   1. Discuss sequence and scheduling of work and interface with other trades.
   2. Review metal wall framing assemblies for potential interference and conflicts and coordinate layout and support provisions for interfacing work.
C. Mock-Up: Coordinate mock-up materials and requirements with Mosaic Architecture. Approved mock-up may remain as part of work.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Delivery: Deliver materials and components in manufacturers’ original, unopened and undamaged containers or bundles, fully identified. Exercise care to avoid damage during unloading, storing and installation.
B. Store, protect and handle materials and components in accordance with manufacturer recommendations to prevent damage, contamination and deterioration. Keep materials clean, dry, and free of dirt and other foreign matter, and protect from damage due to weather or construction activities.

1.08 WARRANTY
A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
B. Attachment System: Ten (10) year Limited Warranty.
   1. Covers components of the attachment system, including structural failure of components when all the materials and components are supplied and installed per manufacturer’s requirements.
   2. Includes labor to remove and reinstall façade finish panels, finish closures and façade finish accessories necessary to access defective material.

PART 2 PRODUCTS
2.01 RAINSCREEN ATTACHMENT/SUPPORT FRAMING SYSTEM
A. Comply with ANSI/ASHRAE 90.1-2010 definition of continuous insulation (c.i.).
   1. ASTM A653 Galvanized steel is not acceptable.
C. Steel Classification: Structural Steel (SS), Grade 50, 50 ksi Yield.
D. Vertical Girt: Vertical girt with pre-punched attachment holes, directly attached on top of rigid insulation [directly to substrate] at regular spacing, with engineered thermally isolated washer assembly and fasteners.
   1. Steel Thickness: Minimum 0.046-inch thick (18 gauge).
   2. Profile Depth: 0.75 inches.
   3. Girt Fastening Face, Width: 2-inches.
   4. Finish: Painted black at open joint panel assembly.
E. Fasteners:
   1. Sufficient length to provide solid attachment through rigid insulation to structure as required by manufacturer.
   2. Thermal Isolating Washers: Minimum 0.125 inch thick Polyoxymethylene copolymer (POM) washers with integral centering lip to act as a thermal break between wall anchor fasteners and girt.
      a. Tensile Yield Strength: 9.57 ksi per ISO 527.
      b. Melting Temperature: 329 degrees Fahrenheit per ISO 3146.
F. Steel stud framing substrate: Self-drill hex-washer-head stainless steel with 1,000 hour salt-spray rated thermoset polyester coating.

PART 3 EXECUTION
3.01 EXAMINATION
A. Examine substrates and conditions for compliance with manufacturer requirements for installation conditions affecting performance of the work.

3.02 RAINSCREEN ATTACHMENT SYSTEM INSTALLATION
A. Installation:
   1. Install vertical girts in vertical orientation in strict accordance with manufacturer’s installation instructions.
   2. Do not use shims to plumb the wall between the vertical girt and insulation.
   3. Minimum length of installed cut girt is 24-inches and shall be attached with at least two (2) fasteners.
4. Mount box girts, fastened up to 32 inches on center (as determined by the manufactures engineering calculations) over installed rigid insulation, using one wall anchor per pre-punched attachment hole at spacing indicated on engineering calculations.
   a. Check plumb of vertical girts both parallel and perpendicular to the structure.
   b. Tighten screws that attach vertical girt through insulation to substructure to a snug tight condition and not stripped. Do not over-torque beyond manufacturer’s recommendation. If installed using hand tools, verify for each installer at beginning of project using snug-tight criteria. Do not use stripped holes.
   c. Where obstructions are present and unavoidable (i.e. window openings), use laser or chalk line to restart girt.
   d. Locate vertical girt at jamb conditions and outside corner conditions.
   e. Use shearing instruments (i.e. snips, nibbler, etc.) for cutting metal framing components. Saws are not recommended, as the sparks produced during cutting will damage the anti-corrosion coating. If sparks are generated during cutting, be sure the portion of the component to be installed on the building is protected from sparks and that any stockpile near the cutting station is also protected.
   f. The systems components should not be cut while installed on the building, unless using a shearing instrument.
   g. Replace thermal isolator pieces that break during installation.
   h. Provide a 3/8” – 1/2” gap between girts for expansion when multiple lengths of vertical girts are installed.

   END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Mechanically attached PVC membrane roofing system.
   B. Mechanically attached hypalon membrane roofing system.
   C. Fully Adhered, PVC Pedestrian Traffic Coating Membrane (at main floor Northwest exit way only)
   D. Bid Alternate description:
      1. Base Bid: lower roof (generally at 116’ deck height, west of grid 3) to be hypalon membrane. Remainder of roof, upper roof and roof at east deck and canopy to be PVC membrane.
      2. Alternate bid: all roofing to be hypalon membrane system.

1.02 SCOPE OF WORK
   A. Contractor shall submit proposal to provide all labor, material, equipment, and tools as required work in this section and related sections.
   B. Contractor shall provide new fully adhered roof membrane system and flashings in accordance with manufacturer requirements and as per specified in the section. Note; it is the contractors responsibility to verify all the job site conditions, including but not limited to roof measurements, roof access, core cuts, etc. The owner will not pay for any extra work if the contractor failed to ascertain or verify the job condition prior to submitting a bid. It will be the contractor’s responsibility to comply with all manufacturer requirements. (i.e. minimum flashing heights). The contractor shall include in their bid any modification required by the manufacturer of the membrane in order to provide the owner with the 20 year NDL warranty as per this specification. (Peel stops required for 90 mph wind speed warranty).
   C. At all drain locations: the contractor shall test all drains and associated piping prior to starting roofing operations. If the drains and piping are not functioning properly, the contractor is to notify the owners’ representative and the owner will be responsible for cleaning the associated drain piping. The owner can not assume any financial responsibility for drain and associated pipe repairs if this procedure is not followed prior to starting roofing operations. At the completion of the roofing, all drains and associated piping are to be functioning properly. See plans for additional wall scuppers to be installed.
   D. Contractor shall obtain the necessary building permit as required by state, local and agencies.
   E. Install 2 layers of polyisocyanurate (R30 total) minimum insulation mechanically attached where noted on plans.
   F. Install a 1/4” per foot positive slope Poly ISO taper system for areas noted on plans.
   G. Install 1/2” glass fiber cover board fully adhered per manufactures recommendations where noted on plans.
   H. Wrap parapets and all roof edges past the nailers with membrane to outside and install new manufactured edge-metal. (Install weldable metal on all cutter edges per details).
   I. Install walk-off pads as indicated on plans.
   J. Provide manufacturer’s 20-year no-dollar-limit warranty.
   K. Provide Category 5 and Color-fast warranties on the Manufactured metal.

1.03 DEFINITIONS
   A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA’s “The NRCA Roofing and Waterproofing Manual” for definition of terms related to roofing work in this Section.
1.04 PERFORMANCE REQUIREMENTS
   A. General Performance: Installed membrane roofing and base flashing shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
   B. Material Compatibility: Provide materials that are compatible with one another under conditions of service and application required as demonstrated by testing or field experience.
   C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing agency to resist uplift pressures calculated according to ASCE7/SEI7.
      1. Corner Uplift Pressure: 75 lbf/sq. ft.
      2. Perimeter Uplift Pressure: 75 lbf/sq. ft.

1.05 GENERAL DESCRIPTION
   A. Membrane roofing utilizing a nominal 50-mil fleece back off-white KEE thermoplastic membrane fully adhered.

1.06 SPECIAL CONDITIONS
   A. This specification must be followed without variation as it applies to only the building roofs having deck structures capable of supporting the guidelines set forth herein.
   B. All deviations from this specification require review before any specification change is valid.

1.07 DESIGN CONSIDERATIONS
   A. Membrane that could be subjected to chemical discharge not listed on the membrane manufacturer's chemical resistance publication.
   B. Membrane that could be subjected to unusual wear and tear may require the inclusion of walk-boards.
   C. Compliance with EPA and OSHA requirements as published by Local, State and Federal authorities.

1.08 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: For each type of product indicated.
   C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
   D. Samples for Verification.
   E. Rib system sample of color chosen.
   F. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product.
   G. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
   H. Submit evidence of compliance with performance requirements.
   I. Research/evaluation reports.
   J. Qualification Data: For Installer and manufacturer.
   K. Field quality-control reports.
   L. Maintenance Data: For roofing system to include in maintenance manuals.
   M. Source Limitations: Obtain components for membrane roofing system from same manufacturer as membrane roofing.
   N. LEED Submittal:
1. Product Data for Credit MR4.1 and Credit MR4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.

2. SRI data on all colors specified.

O. Warranties: Special warranties specified in this Section.

P. Inspection Reports: Copy of roofing system manufacturer's inspection reports, in progress and completed of roofing installation.

1.09 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm with ten years experience installing thermoplastic membrane for proposed material approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty. Contractor must have a place of business within three hours of project by land. Installer Qualifications: A qualified firm with 3-years (minimum) documented experience installing thermoplastic membrane for proposed material approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty. Contractor must have a place of business within four hours of project. Submit the following qualification data:
   1. Project Foreman or Superintendent shall have supervised a minimum of three (3) projects of similar size and scope as this project and material. Contractor shall provide name and address of three (3) projects of similar size and scope as this project of same material. Include contact name and phone number for reference.

B. Manufacturer Qualifications: A qualified manufacturer with twenty (20) years experience manufacturing the same membrane without formulation changes. The roofing membrane and system shall be identical to that used for this project and which can show evidence of these materials being satisfactorily used on at least three (3) projects of similar size, scope and type within such a period.

C. Fire-Test-Response Characteristics: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
   1. Exterior Fire-Test Exposure: Class A; for application and roof slopes indicated.

1.10 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.(NDL).
   1. Warranty Period: 20 years from date of Substantial Completion, and shall not include exclusions for ponding water.
   2. 90 mph wind rider.
   3. 1.5 inch hail rider.
   4. Supply owner with the Category 5 wind and color -fast warranty on Manufactured metal.

B. Special Project Warranty: Submit roofing Installer's warranty, signed by Installer, covering the Work of this Section, including all components of membrane roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards and walkway products, for the following warranty period:
   1. Warranty Period: 20 years from date of Final Acceptance.
PART 2 PRODUCTS

2.01 THERMOPLASTIC ROOF MEMBRANE

A. HYPALON ROOF:

1. Hypalon CSPE roof membrane as manufactured by Burke Rubber Company, 2250 South 10th Street, San Jose, CA 95112. (408) 29-3500.  www.burkind.com
2. Basis of Design: Hypalon, CSPE thermoplastic membrane
4. Scrim: polyester
5. Color: white
6. Thickness: 0.045 inches
7. Role width: 61 inches
8. Specific gravity: 1.65
9. Tensile Strength, psi: 800 per ASTM D412
10. Elongation %: 400 per ASTM D412
11. Tear Resistance, lb: 6 per ASTM D1004
13. Water absorption, % weight gain: 5 per ASTM D471 7 days
14. Low temperature brittleness: -40 degrees farenheit per ASTM D1790

B. BID OPTION IN LIEU OF HYPALON ROOF MEMBRANE:

   a. Thickness: 50 mils (1.1 mm), nominal.
   b. Color:
      1) White.
   c. Inter-ply Reinforcement to be 18 x 21 / 1,100 x 1,100 denier weft reinforced polyester knit fabric coated with an adhesive coat to promote a molecular bond between the base fabric and the front and back coats.
4. Tensile Strength: ASTM D-882: 9,500 lbs. (668 kgf/cm2).
12. Oil Resistance: Mil-C-2069C: No swelling, cracking, leaking.

C. PVC Pedestrian Traffic Coating Membrane: Duradek Ultra; polyester reinforced PVC membrane with ultra-violet resistance, for fully-adhered installation with heat-welded seams and perimeter attachment.

1. Sheet Width: 72 inches (1828.8 mm) or 60 inches (1524.0 mm)
2. Overall Sheet Thickness: 0.060 inch (1.5 mm).
3. PVC Film Thickness: 0.050 inch (1.3 mm).
4. Coefficient of Friction: >0.50
5. Color: Ultra Classic Series: Steel
7. Provide Surface Conditioners, Adhesives, Sealants, Fillers, and Cleaners as required for proper installation.
2.02 AUXILIARY MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with membrane roofing.
   1. Liquid-type auxiliary materials shall meet VOC limits of authorities having jurisdiction.
   2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
      a. Plastic Foam Adhesives: 50 g/L.
      b. Gypsum Board and Panel Adhesives: 50 g/L.
      c. Multipurpose Construction Adhesives: 70 g/L.
      d. Fiberglass Adhesives: 80 g/L.
      e. Contact Adhesive: 80 g/L.
      f. Other Adhesives: 250 g/L.
      g. PVC Welding Compounds: 510 g/L.
      h. Adhesive Primer for Plastic: 650 g/L.
      i. Single-Ply Roof Membrane Sealants: 450 g/L.
      j. Non-membrane Roof Sealants: 300 g/L.
      k. Sealant Primers for Nonporous Substrates: 250 g/L.
      l. Sealant Primers for Porous Substrates: 775 g/L.

B. Laminated Metal: 24 GA. hot dipped G-90 laminated with polymeric coating supplied by System Manufacturer. Indicated on drawings as "weldable metal".

C. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as KEE sheet membrane.

D. Bonding Adhesive: Manufacturer's standard, solvent based for Fleece back 290 or CR20.
   1. 190 bonding adhesive for bareback membranes.

E. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors. (Counter flash for 20 yr warranty).

F. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick (25 mm wide by 1.3 mm thick), pre-punched.

G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

I. Walk-off pads: Flexible Walkways: Factory-formed , nonporous, heavy-duty, slip-resistant, surface-textured walkway rolls, approximately 5/32 inch thick and 30" wide, and acceptable to membrane roofing system manufacturer. Similar to FiberTite Mellow Yellow walkways. Hot air weld the entire perimeter of the walkway to the roofing membrane.

J. COVERBOARD
   2. Fasteners: Factory-coated steel fasteners and metal plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

2.03 DECK SHEATHING AND COVER BOARDS

A. Deck Sheathing: Gypsum sheathing, ASTM C1396/C1396M, Type X special fire resistant type, paper face, 5/8 inch thick.
   1. Product: Securock, distributed by Carlisle.

B. Coverboard: cover board approved by roofing manufacturer and required for hail warranty, complying with ASTM C1325.
2.04 INSULATION
   A. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, fiber reinforced felt both faces; Grade 2 and with the following characteristics:
      1. Compressive Strength: 20 psi.
      3. Tapered Board: Slope as indicated; applied on top of Base Boards with minimum thickness 1/2" inch at roof drains; fabricate of fewest layers possible.

2.05 ACCESSORIES
   A. Prefabricated Roof Accessories:
      1. Corners and Seams: Same material as membrane, in manufacturer's standard thicknesses.
      2. Penetrations: Same material as membrane, with manufacturer's standard cut-outs, rigid inserts, clamping rings, and flanges.
      3. Walkway Rolls: Sure-Flex Heat Weldable Walkway Rolls; 80 mils (0.080 inch) thick; gray membrane.
         a. Hypalon: Burke Hypalon Walk Mat (M531). Thickness = 0.125 inches, 30" widths. Quantity as required to cover areas shown on roof plan.
         c. PVC: Carlisle Sure-Flex Walkway rolls. 60 mil minimum thickness. 36" width.
   B. Membrane Adhesive: As recommended by membrane manufacturer.
   C. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.
   D. Sealants: As recommended by membrane manufacturer.
   E. Cleaner: Manufacturer's standard, clear, solvent-based cleaner.
   F. Edgings and Terminations: Manufacturer's standard edge and termination accessories.
      1. Fascia - upper roof: ATAS International - Rapid-LOK Fascia with 4" vertical face dimension.
         a. Prefinished steel: 24 gauge
         b. 20 gauge continuous cleat
         c. 6" splice panels at each joint
         d. Wind rating warranty: 120 mph
         e. Finish: PVFD per AAMA 2605-13
         f. Color: to match metal siding color, metallic dark charcoal grey.
      2. Custom Fascia System at lower roofs: Custom manufactured in profile indicated.
         a. Prefinished steel: 24 gauge
         b. 20 gauge continuous cleat
         c. 6" splice panel at each joint
         d. Section length: minimum 12 feet
         e. Finish: PVFD per AAMA 2605-13
         f. Color: to be selected to match metal siding color: metallic dark charcoal grey.
      3. Termination Bar:
         a. At exposed areas: Metal Era - CB175 with CF-175 finished cover metal. Metal Era, 1600 Airport Road, Waukesha, WI 53188. 1-800-373-9156. www.metalera.com
         b. At non-exposed areas: standard 1 1/4" aluminum anodized termination bar

PART 3 EXECUTION
3.01 MATERIAL DELIVERY, HANDLING AND STORAGE
   A. Deliver all materials and/or packages to the jobsite in manufacturer's original, unopened containers, with legible labels and in sufficient quantity to allow for continuity of work.
B. Select and operate material handling equipment in a safe manner, guarding against damage to existing construction or newly applied roofing and conforming to manufacturer's recommendations of handling and storage.

C. Provide appropriate protection to those materials subject to degradation from weather conditions, i.e., moisture, wind, extreme cold or heat as per manufacturer's recommendations. Store materials a minimum of 8 inches off the ground. Cover materials at all times with tarps or approved covers.

D. Remove all damaged materials from construction site.

3.02 JOB CONDITIONS
A. Provide special protection on newly completed roofing to avoid unusual wear and tear during installation. All entrances to roof area will require 6' x 6' platform of insulation and plywood during construction.

B. Protect building walls, rooftop units, windows and other vulnerable components during installation.

3.03 INSULATION INSTALLATION
A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.

C. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (68 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction. Loose lain to be retained by top cover board fasteners.

D. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together and fasten to roof deck per manufactures details.

E. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.
   1. 3” corners, 6” perimeter, 12” field in low rise adhesive per manufactures details.

3.04 MEMBRANE ROOFING INSTALLATION
A. Fully adhered membrane roofing over area to receive roofing and install according to roofing system manufacturer's written instructions.

B. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.

D. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

E. One peel stop required 18” from the perimeters and corner fastened topside at 12” on center.

F. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.
   1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
   2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
   3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

3.05 BASE FLASHING INSTALLATION
A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.06 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.07 PREPARATION, GENERAL

A. Clean substrate thoroughly prior to roof application.

3.08 METAL DECK PREPARATION

A. Install deck sheathing on metal deck:
   1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
   2. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface.
   3. Tape joints.

3.09 INSULATION

A. Apply vapor retarder to deck surface with adhesive in accordance with manufacturer's instructions.
   1. Extend vapor retarder under cant strips and blocking to deck edge.
   2. Install flexible flashing from vapor retarder to air seal material of wall construction, lap and seal to provide continuity of the air barrier plane.

B. Ensure vapor retarder is clean and dry, continuous, and ready for application of insulation.

C. Lay subsequent layers of insulation with joints staggered minimum 6 inch from joints of preceding layer.

D. On metal deck, place boards parallel to flutes with insulation board edges bearing on deck flutes.

E. Lay boards with edges in moderate contact without forcing, and gap between boards no greater than 1/4 inch. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

F. Do not apply more insulation than can be completely waterproofed in the same day.

3.10 MEMBRANE APPLICATION

A. ALL MEMBRANES TO BE INSTALLED PER MANUFACTURE'S INSTRUCTIONS. HAVE COMPLETE INSTRUCTIONS ON SITE DURING ROOF INSTALLATION. MANUFACTURER'S INSTRUCTIONS TAKE PRECEDENCE OVER THESE SPECIFICATION FOR INSTALLATION METHODS.

B. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

C. Shingle joints on sloped substrate in direction of drainage.

D. Seam Welding:
1. Seam Welding: Overlap edges and ends and seal seams by heat welding, minimum 2 inches.
2. Cover all seams with manufacturer's recommended joint covers.
3. Probe all seams once welds have thoroughly cooled. (Approximately 30 minutes.)
4. Repair all deficient seams within the same day.
5. Seal cut edges of reinforced membrane after seam probe is complete.

E. Mechanical Attachment:
1. Apply membrane and mechanical attachment devices in accordance with manufacturer's instructions.

F. At intersections with vertical surfaces:
1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
2. Fully adhere flexible flashing over membrane and up to nailing strips.

G. Coordinate installation of roof drains and sumps and related flashings.

H. Daily Seal: Install daily seal per manufacturers instructions at the end of each work day. Prevent infiltration of water at incomplete flashings, terminations, and at unfinished membrane edges.

3.11 FIELD QUALITY CONTROL
A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
C. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

3.12 CLEANING
A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
B. Remove bituminous markings from finished surfaces.
C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.
D. Repair or replace defaced or damaged finishes caused by work of this section.

3.13 PROTECTION
A. Protect installed roofing and flashings from construction operations.
B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION
SECTION 07 6100
LINEAR METAL SOFFITS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Fabricated linear metal soffits, including trim, flashings, counterflashing.
B. Matching trim and accessories.
C. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS
A. Section 05 4000 - Cold Formed Metal Framing: Metal framing for support of aluminum soffits.
B. Section 07 2100 - Building Insulation: Rigid thermal insulation installed behind siding.
C. Section 07 6200 - Flashing and Sheet Metal: Sheet metal gutters and downspouts.
D. Section 07 9000 - Joint Sealers: Sealants used in conjunction with aluminum soffit panel.

1.03 REFERENCE STANDARDS
A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2015.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
C. LEED Submittals: Provide documentation of how the requirements of Credit will be met:
   1. Innovation: Product data and certification letter indicating how exterior powder coatings support innovation LEED credit.
   2. No Volatile Organic Compounds: Product data and certification letter indicating that powder paint do not contribute to air pollution/ozone depletion and complies with environmental regulations.
   3. Chrome Free Pre-Treatment: Product data and certification letter indicating that your process does not contain chromates, cyanides or heavy metals.
D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
E. Verification Samples: For each finish product specified, two samples, minimum size 2 inches by 3-1/2 inches, representing actual product, color, and gloss.
F. Manufacturer's Certificates: Certify products meet and exceed specified requirements.
G. Closeout Submittal: Provide manufacturer's maintenance instructions that include recommendations for periodic cleaning and maintenance of components.

1.05 QUALITY ASSURANCE
A. Mock-up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Mosaic Architecture.
   2. Do not proceed with remaining work until workmanship, color, and gloss are approved by Mosaic Architecture.
   3. Refinish mock-up area as required to produce acceptable work.
1.06 DELIVERY, STORAGE, AND HANDLING
   A. Packaged and store products under cover in manufacturer's unopened packaging until ready for transport and installation.

1.07 WARRANTY
   A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
   B. Mayne Coatings Corp. limited warranty against cracking, peeling, gloss and color retention for Aluminate premium wood finishes.

PART 2 PRODUCTS

2.01 MANUFACTURERS
   A. Metal Sales Manufacturing Corporation, 545 South 3rd Street, Suite 200, Louisville, KY 40202
   B. Metal Sales Contact:
      1. Toll Free: 800.406.7387
      2. Phone: 502.855.4300
      3. Fax: 502.855.4200
      4. Web: www.metalsales.us.com
      5. E-Mail: info@metalsales.us.com
   C. Acceptable Manufacturer: Metal Sales manufacturing corporation, www.metalsales.us.com
   D. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS
   A. Linear metal soffit: Metal Sales TLC-3
      1. Size:
         a. Width: 12 inches, with center groove
      2. Length:
         a. 12 feet.
      3. Material: Aluminum-zinc alloy-coated steel sheet,
         a. ASTM A 792, AZ50 or AZ55 coating designation,
         b. structural quality, Grade 50, 0.0236 inch (0.60 mm) (24 gauge),
   B. Accessories:
      1. Provide with matching J metal edging, hat channel sub-framing, misc trim, as required.
   C. Finish:
      1. PVDF Kynar 500 polyester finish.
      2. Color: to be selected from manufacturers entire line.
   D. Water Penetration: No penetration at 12 psf when tested according to ASTM E 331.

2.03 FABRICATION
   A. Prepare surfaces, pre-treat and coat components in accordance with AAMA 2604 and 2605 Quality Standards and applicable European standards for the coating material specified.
   B. Wrap and package coated components using methods suitable for transit and covered site storage without damage.
   C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

2.04 FACTORY FINISHING
   B. Primer Coat: On coated sheets, finish concealed side of sheet with primer compatible with finish system as recommended by finish system manufacturer.
PART 3 EXECUTION

3.01 EXAMINATION
   A. Do not begin installation until colors have been verified.
   B. If preparation is the responsibility of another installer, notify Mosaic Architecture of unsatisfactory preparation before proceeding.

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

3.03 INSTALLATION
   A. Install in accordance with manufacturer’s instructions.
   B. Install soffits and accessories in accordance with best practice, with all members plumb and true.
   C. Overlap and miter all trim corners.
   D. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.

END OF SECTION
SECTION 07 6200
SHEET METAL FLASHING AND TRIM

PART 1  GENERAL
1.01  SECTION INCLUDES
   A. Fabricated sheet metal items, including flashings, counterflashings, gutters, and downspouts.
   B. Reglets and accessories.

1.02  RELATED REQUIREMENTS
   A. Section 07 9005 - Joint Sealers.

1.03  REFERENCE STANDARDS
   B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

1.04  SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
   C. LEED Submittal:
      1. Product Data for Credit MR4.1 and Credit MR4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.
      2. Product Data for MR 5: Regional Materials. For products that have been extracted, harvested or recovered, as well as manufactured within 500 miles of the project site.
   D. Samples: Submit two samples 4 x 4 inch in size illustrating metal finish color.

1.05  QUALITY ASSURANCE
   A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.
   B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

1.06  DELIVERY, STORAGE, AND HANDLING
   A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
   B. Prevent contact with materials that could cause discoloration or staining.

PART 2  PRODUCTS
2.01  SHEET MATERIALS
   A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage (0.0239) inch thick base metal, shop pre-coated with PVDF coating.
      1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
2. Color: As selected by Mosaic Architecture from manufacturer’s full colors. Manufacturer must provide a dark metallic charcoal grey option.


2.02 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.
C. Primer: Zinc chromate type.
D. Protective Backing Paint: Zinc molybdate alkyd.
E. Sealant to be Concealed in Completed Work: Non-curing butyl sealant.
F. Sealant to be Exposed in Completed Work: ASTM C920; elastomeric sealant, 100 percent silicone with minimum movement capability of plus/minus 25 percent and recommended by manufacturer for substrates to be sealed; clear.
G. Sealant: Type specified in Section 07 9005.
H. Plastic Cement: ASTM D4586, Type I.
I. Reglets: Surface mounted type, galvanized steel; face and ends covered with plastic tape.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
B. Form pieces in longest possible lengths.
C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
D. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
F. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.04 GUTTER AND DOWNSPOUT FABRICATION

A. Gutters: Profile as indicated. Gutters to be formed from roof membrane system.
B. Downspouts: Round profile. Downspouts to be galvanized iron pipe, schedule 40
C. Gutters and Downspouts: Size indicated on drawings.
D. Accessories: Profiled to suit gutters and downspouts.
   1. Anchorage Devices: In accordance with SMACNA requirements.
   2. Downspout Supports: Brackets.
E. Downspout brackets: Custom Steel, see details
F. Downspout chains: 3/8” galvanized chain with galvanized anchors to concrete anchor. See details.
G. Seal metal joints.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.
B. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.
C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 INSTALLATION

A. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
B. Apply plastic cement compound between metal flashings and felt flashings.
C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
D. Seal metal joints watertight.
E. Secure gutters and downspouts in place using concealed fasteners.
F. Slope gutters 1/4 inch per 10 feet, minimum.
G. Connect downspouts to downspout boots. Grout connection watertight.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for field inspection requirements.
B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION
SECTION 07 7100
ADJUSTABLE DECK PEDESTALS

PART 1 GENERAL
1.01 SECTION INCLUDES
A. Adjustable Deck Pedestals.

1.02 RELATED REQUIREMENTS
A. Section 07 5400 - Thermoplastic Membrane Roofing.

1.03 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.
C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.
D. LEED Submittal:
   1. Product Data for Credit MR4.1 and Credit MR4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.
E. Manufacturer's Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.

1.04 PROJECT CONDITIONS
A. There are no pedestal installation temperature restriction guidelines other than the practical considerations of working in any unsafe condition or inclement weather.
B. Deck supports specified are to be for used with pedestrian traffic only.
C. Pedestrian decks must be restrained by perimeter blocking or walls on all sides. Lateral movement greater than one tab width is unacceptable and will be rejected.
D. All decks shall be designed to not exceed the design capacity of the pedestal.
E. The substrate immediately below the pedestals shall provide positive drainage.

1.05 WARRANTY
A. At project closeout and upon request, Bison Deck Supports can provide to the Owner, an executed copy of the manufacturer's standard document outlining the terms, conditions and limitations of their limited warranty against manufacturing defect for a period of (5) years.
B. The contractor warrants that this work will remain free from defects of labor and materials used in conjunction with this work in accordance with the general conditions for this project or a maximum of (5) years.
C. Decks should not have lateral movement in excess of one tab width.

PART 2 PRODUCTS
2.01 MANUFACTURERS
A. Bison Deck Supports; 1975 W. 13th Ave; Denver, CO 80204; Phone: 888-412-4766; www.bisondecksupports.com
B. VersiJack Adjustable Deck Pedestals, Height Adjustable and Index Sloping; Tournesol Siteworks; www.tournesol siteworks.com
C. Substitutions: See Section 01 6000 - Product Requirements.

2.02 APPLICATION/SCOPE
A. Furnish and install a complete adjustable deck support system with a maximum cavity height of up to: 
1. Screwjack Pedestals maximum cavity height of 16 inches or up to 24 inches with additional bracing, see

2. Deck supports are not designed for supporting decks that carry vehicular traffic or equipment including but not limited to snow removal equipment, ATV's, forklifts or any motorized vehicles.

3. Consult the manufacturer and an engineer regarding the following:
   a. When spacer tab condition or design requires spacing between decking tiles other than the standard spacing required by the manufacturer.
   b. When considering use of other than raised decks.
   c. When the required pedestal height exceeds the safe limits as determined by the manufacturer.
   d. When pedestal load capacity exceeds the maximum listed in this specification.
   e. When anticipating installation of any items with excess weight on top of the deck.
   f. When using Bison Deck Supports on grade. (soil).
   g. When greater than the listed weight rating per pedestal load capacity is required.

2.03 SCREWJACK DECK PEDESTALS

A. Typical Height Range 0-16 inches, Weight Bearing Design Capacity 1000 lbs/pedestal FS.2 Integral (3/16 inch) spacer tabs.

B. Pedestals: As applicable for roof slope condition:
   3. Model B3: 3 to 4-3/4 inches.
   5. Model B3 + C4: 7-3/4 to 9 inches.
   6. Model B4 + C4: 9 to 12 inches.
   7. Rotating Base:
      a. Size: 7-7/8 inch diameter x 3/16 inch top wall thickness.
      b. Bearing Surface Area: 48 square inches.
      c. Four (4) - 1/4 inch diameter holes for drainage and/or mechanical attachment.
   8. Top Unit: 5/32 inch thick plate with a 29 square inch bearing surface.
   10. Spacer tab: 4.5 mm thick for uniform spacing between pavers.
   11. Load Capacity: Maximum 1,000 lbs. per pedestal with a safety factor of 2 (FS2).

C. Fixed Height Pedestal Supports:
   1. Model HD50 - 1/2 inch tall, with spacer tabs, 4.5 mm.
   2. Model HD75 - 3/4 inch tall, with spacer tabs, 4.5 mm.
   3. Optional Insert Spacer Tabs: 1/8 inch or 4.5 mm.
   4. Bearing Surface Area: 14 square inches.

D. Leveler Disks:
   1. Model LD4 - Placed beneath pedestals to compensate for slopes up to 1 inch per foot.
      Slope 1/4 inch per foot, may stack up to four under one pedestal for up to one inch of slope compensation. Center point thickness 3/8 inch.
   2. Model PH5 - Top mounted adjusting leveler disk used for precise top leveling with incremental adjustment from zero to 5/8 inch per foot.

E. Shims:
      a. Material: 1/16 inch EVA.
      a. Material: 1/8 inch or 1/16 inch Flexible PVC.

F. Base Pads:
   1. Model FBB: Pedestal base pad for on grade use, provides a large 12 inch x 12 inch x 1/4 inch base bearing surface for on grade installation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.
B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
C. Verify all elevations, required pedestal heights and deck dimensions before commencing work.

3.02 PREPARATION

A. Establish accurate lines, levels and pattern.
B. The substrate surface that will receive the deck supports must be well compacted (on grade) and structurally capable of carrying the dead and live loads anticipated.
C. The substrate must be clean and free of projections and debris that could impair the performance of the pedestals or the total deck system.
D. Decks over roofing or waterproofing, verify that installation conforms to Section 1.71 of this section.
E. Installation requirements vary on each individual project site. Deck materials used, pattern, grid layout, starting point and finished elevation should be shown on plan view shop drawings which have been prepared and approved by the Architect.
F. Once a starting point and the finished elevation of the deck surface have been determined, the support system elevation (finished elevation minus deck material thickness) is established and marked around the perimeter using a transit "torpedo" water level or laser leveling device.
G. Precise measurements should be taken and deck area should be accurately defined. Mark off and square all outside edges with control lines (chalk or spray paint). Install two (2) lines that are perpendicular to each other across the deck area. Continue to mark a grid of lines in both directions marking the location of each pedestal. To assure a square layout, use the control lines as references to periodically check the layout during installation.

3.03 INSTALLATION

A. Install components in accordance with manufacturer's instructions.
B. If required, place a floating insulation base board or floating foundation base in the location on the grid of each pedestal.
C. Next, a deck support must be placed where each measured grid line meets the perimeter. Normally the deck support is positioned as close to the perimeter as possible, with the two remaining spacer tabs aligned with the grid line. Using the "top of pedestal" elevation marked on the perimeter, stretch a masons line along and slightly ahead of the second row of deck supports. A laser leveling device may also be used for this purpose.
D. On larger decks, it is recommended that pedestals be pre-sorted and pre-set to the proper elevation and placed in position prior to installation of pavers and tiles.
E. As the deck supports located along the grid lines are loaded with pavers and tiles, fine vertical adjustment can be made by rotating the base or bottom of the deck support. Clockwise rotation of the pedestal base will raise the bearing surface of the deck. Counter-clockwise rotation will lower the top bearing surface.

F. Certain Bison pedestals have built in safety windows. If the "safety window" located in the screw cylinder become visible on these models, it indicates that the deck support is extended beyond the minimum required engagement of threads. A coupling unit must be added to achieve the desired height. Never use a pedestal when the safety windows are exposed. Always maintain adequate thread engagement. Never over extend any pedestal.

G. Slight irregularities in decking panel thickness can be compensated for by using one to two shim segments. Place on top of pedestals, under the corners of the decking paver. Use no more than (2) shims on top of the pedestal and always adhere 1/4 wedges with construction adhesive.

H. Stackable Fixed Height Pedestal: Complete deck and grid layout as instructed above. Stack no more than (4) fixed height pedestals together and place in lieu of adjustable pedestals where needed. Spacer tabs can be removed to accommodate perimeter and corner support locations.

I. Slope Compensation:
   1. Preferred Method: A base leveler disk can be used to level the pedestal base. Place one to four disks under the pedestal base to compensate for up to 1 inch per foot of slope. Compensate for slope by placing the disks, thickest edge (located on the edge by a small finger tab) at the down slope side of the deck support, one disk compensates for 1/4 inch per foot of slope. Using two to four disks, rotate one in relation to the other to create a level deck support.
   2. Shims may be used in multiples, whole or segmented and placed under the base to level the deck supports.
   3. Under a Pedestal: All shims under a pedestal must be adhered with construction adhesive. Shim no more than 1/8 inch beneath each pedestal.
   4. On top of pedestal: Use no more than 2 shims.
   5. Use top mounted adjusting leveler disk. PH5 to compensate for slopes up to 5/8 inch per foot. Turn the top leveler disk to expose a number of 1 to 5 percentage of the slope in the slight window (1 = less slope, 5 = more slope). Locate the arrow on top of the leveler disk that corresponds to the number in the slight window, place the deck support so that the numbered arrow point directly downhill.

3.04 DECK SUPPORT PLACEMENT AND FINAL ADJUSTMENT
   A. Deck supports and the deck surface panels must be placed as the manufacturer directs in these written instructions.
   B. Pedestals are designed to be rotated for final slight adjustment when pedestals are fully loaded. Deck supports should be leveled in each succeeding row as the installation proceeds. Final height adjustment or maintenance is easily made by simply rotating the base clockwise or counter-clockwise direction to raise or lower the deck surface material.
   C. Additional sections of shims may be used and should be available for regular maintenance. Shims may be used in multiples, whole or segmented and placed under the base or on top of the pedestal to level the deck support. On top of pedestal, use construction adhesive to adhere sections to shims. Construction adhesive is not required when using whole shims on top of pedestal. Beneath a pedestal, construction adhesive is always required when using sections of shims and/or whole shims.

3.05 PERIMETER CONTAINMENT
   A. Any area of a deck that is not restrained by a parapet wall must be boxed in and contained. The deck panels will move in all sides are not adequately restrained. Perimeter framing and edging boards located at the outside of the deck perimeter must be installed to provide restraint. No movement should be allowed at the perimeter of the deck system greater than one tab width.
3.06 FIELD QUALITY CONTROL
   A. Inspect often during installation to assure that grid spacer lines are being maintained in a straight and consistent pattern and that deck panels or pavers are level and not rocking.
   B. Conform that deck pedestal height does not exceed the specified height for the pedestal line. Confirm that pedestal heights in excess of the maximum allowable height of 16 inches have been braced and that proper authorization has been received.
   C. Unless otherwise specified in writing to allow for expansion, inspect to assure that all paver spacing between tiles and at perimeter containment does not exceed a tab width. Particular attention should be made to assure that all pedestrian entry or access points to the deck are level and that the deck surface tiles are not randomly raised or uneven creating a tripping or safety hazard.

3.07 IMMEDIATELY FOLLOWING INSTALLATION
   A. Mosaic Architecture shall carefully inspect the deck system to be positive that:
      1. The new deck system is adequately blocked on all sides to contain the surface decking and related components.
      2. There is no more than tab width spacing between any deck panels and at all sides of the deck perimeter.
      3. There is no ballasting rock used to fill any perimeter voids.
      4. There is no “rocking” of deck panels as foot traffic is applied to the surface decking.
      5. All required spacer tabs are in place and visible.

3.08 ROUTINE MAINTENANCE AND CARE
   A. Installer has the duty to instruct the deck owner about performing routine maintenance of the deck. Check for rocking pavers and adjust shim immediately. Pedestals can settle and may have to be realigned. Failure to do so can cause a tripping hazard. Periodically check spacer tabs and immediately replace broken tabs to limit deck movement. Make sure all the edge restraint stays intact and structurally sound.

END OF SECTION
SECTION 07 7123
CONCRETE ROOF PAVERS

PART 1 GENERAL

1.01 SUMMARY
A. Furnish materials, labor, transportation, services, and equipment necessary to furnish and install

1.02 RELATED REQUIREMENTS
A. Section 07 5419 - PVC Thermoplastic Single-Ply Roofing.

1.03 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data:
   1. Manufacturer's data sheets on each product to be used, including preparation instructions, installation methods, Storage and handling requirements and recommendations.
   2. Submit test results from an independent testing laboratory for compliance with performance requirements specified herein.
   3. Submit two copies of written instructions for recommended maintenance.
C. Shop Drawings:
   1. Layout drawings of each paved area showing the pattern of pavers, indicate pavers requiring cutting, indicate setting bed methods in each area, drainage patterns and drains and indicate and relationship of paving joints. Include details of setting beds, noting all materials and their thickness, show details at curbs and vertical surfaces.
   2. Details of custom (nonstandard) curbs and stair tread/risers, include methods of installation
D. Samples:
   1. Submit two complete sets of color chips representing manufacturer's full range of available colors and texture. Color will be selected by Architect / Engineer / Landscape Architect / Owner from manufacturer's available standard and custom colors
E. LEED Submittal:
   1. Product Data for Credit MR4.1 and Credit MR4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Tile Tech Pavers Inc, 888-380-5575 Phone: (213) 380-5560 Fax: (213) 380-5561; E-mail: sales@tiletechpavers.com Website: www.tiletechpavers.com
1. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS
A. Concrete Pavers: Recycled-Glass Series pavers as manufactured by Tile Tech Pavers Inc.
   1. Color: Standard and custom range as manufactured by Tile Tech Pavers Inc.
   2. Size: Nominal 20”x20”.
   3. Thickness: 2”.
   5. Edge Finish: 3/16” bevel on all four (4) sides or straight edge
   6. Weight: 11 to 22 lbs per square foot depending on paver size & thickness

2.03 PRECAST MATERIAL REQUIREMENTS
B. Aggregates: All aggregates to meet ASTM C-33 specifications, cleaned and properly graded to size. Aggregate shall be blended to meet individual project requirements. And to meet ASTM C241 & HA 10 minimum.

C. Coloring: Pigments used shall be inorganic, alkali resistant and used per manufacturer's recommendations.

D. Color Blending: Factory-blend pre-cast paver that has a natural color range so products taken from on batch will have the same range as products from a separate batch.

E. Cleaner: Liquid neutral chemical cleaner with pH factor between 7 and 8, of formulation recommended by sealer manufacturer for type of precast paver used.

F. Sealer: Colorless, slip and stain resistant penetrating or acrylic sealer with pH factor between 7 and 10 that does not affect color or physical properties of precast paver surface.

PART 3 EXECUTION

3.01 EXAMINATION

A. Prior to starting work inspect the substrate to ensure that it has been properly prepared to accept the Tile Tech Pedestal System. The substrate and/or surface shall be clean and free of any projections and debris which may impair the performance of the pedestal and/or the deck system. Verify all elevations, required pedestal heights and deck dimensions. Commencement of work shall imply acceptance of surfaces & deck conditions.

3.02 INSTALLATION

A. Install in accordance with Tile Tech Pavers and other contributing manufacturer's instructions. Installation requirements vary for each individual project site. Decking paver or tile used, pattern, grid layout, starting point, and finished elevation should be shown on plan view shop drawings, which have been prepared and approved by the designer, installing contractor and/or owner.

B. Grid Layout and Elevations:

1. Once the starting point and the finished elevation of the deck surface have been determined, the "Top of Pedestal Elevation" (finished elevation less decking paver or tile thickness) is established and marked around the perimeter using a transit water level or laser leveling device.

2. Precise measurements should be taken and deck area should be accurately defined. Mark off and 'square up' all outside edges with control lines using "snapped" chalk lines. Mark two (2) lines that are perpendicular to each other across the deck area. Continue to mark a grid of lines in both directions marking the location of each pedestal. Use the control lines as references to periodically check and assure a square layout during installation.

3. Next, a pedestal must be placed where each measured grid line meets the perimeter. Remove two (2) spacer tabs in line with one another atop each pedestal system placed around the perimeter. Remove all four (4) spacer tabs at corners.

4. Adjust each pedestal height to the "Top of Pedestal Elevation" marked on the perimeter. Position the pedestal as close to the edge of the perimeter as possible, with the two remaining spacer tabs aligned with the grid line. Using the elevation marked on the perimeter, stretch a mason’s line along and slightly ahead of the second row of pedestals. A laser leveling device may also be used for this purpose.

5. On larger decks, it is recommended that Tile Tech Pedestal System be pre-assembled and pre-set to the proper elevation and placed in position prior to the installation of decking paver or tile.

6. As the pedestals located along the grid lines are loaded with pavers or tiles, fine vertical height adjustment can be made by inserting and rotating, from the top, a T-handle Hex Key into the Uni-Insert™ of the Pedestal assembly. Clockwise rotation of the Uni-Insert™ will raise the bearing surface and the deck. Counter-clockwise rotation will lower the top bearing surface and deck.

7. Always maintain adequate thread engagement. Tile Tech Pedestal Uni-Insert™ contains a locking tab that will not allow the screw to extend past its maximum extension. Never use if
the locking tab is broken. If the height required goes beyond the Uni-Insert™ limit recut PVC pipe to the correct height and re-assemble the pedestal using the correct size pipe.

8. Slight irregularities in decking paver or tile thickness can be compensated for by using one (1) to two (2) shim segments. Place on top of the pedestal, under the corner(s) of the decking paver or tile. Use no more than two (2) shims on top of the pedestal and always adhere quartered (1/4) wedges with construction adhesive.

C. Perimeter Containment:

1. Any area of the pedestal deck that is not restrained by a parapet or foundation wall must be ‘boxed-in’ and contained. The deck panels will move if all sides are not adequately restrained. Perimeter framing and edging boards located at the outside of the deck perimeter must be installed to provide restraint. No movement should be allowed at the perimeter of the deck system greater than one tab width.

END OF SECTION
SECTION 07 7200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Roof hatches.
   B. Fall Protection System: Guardian horizontal lifeline system (HLL) including anchor points, cable
      line, line terminations, and Absorbinator system.

1.02 RELATED REQUIREMENTS
   A. Section 05 3100 - Steel Decking.
   B. Section 07 6200 - Sheet Metal Flashing and Trim: Roof accessory items fabricated from sheet
      metal.

1.03 REFERENCE STANDARDS
   A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or
      Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
   B. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated
      by the Hot-Dip Process; 2010 (Reapproved 2015).
   C. FM (AG) - FM Approval Guide; Factory Mutual Research Corporation; current edition.
   D. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.04 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Manufacturer's data sheets on each product to be used.
      1. Preparation instructions and recommendations.
      2. Storage and handling requirements and recommendations.
      3. Installation methods.
      4. Maintenance requirements.
   C. Shop Drawings: Submit detailed layout developed for this project. Show dimensioned location
      and number for each type of roof accessory.
   D. Submit complete system layout by system supplier indicating all required components and
      attachment details for a complete system.

1.05 DELIVERY, STORAGE, AND HANDLING
   A. Store products in manufacturer's unopened packaging until ready for installation.
   B. Store products under cover and elevated above grade.

PART 2 PRODUCTS

2.01 ROOF FALL PROTECTION SYSTEM
   A. Manufacturers - Fall Protection System:
      1. Guardian Fall Protection. www.guardianfall.com
      2. Substitutions: See Section 01 6000 - Product Requirements.
   B. Horizontal lifeline fall restraint system: Manufacturer's horizontal lifeline system with shock
      absorption.
      1. Provide manufacture's design drawings for complete system rated at 5,000 pounds with
         worker capacity of up to 420 pounds.
      2. Provide complete OSHA compliant system.
      3. System to include anchor points with top anchor hardware. Provide anchor compatible with
         roof deck. Provide anchor points with height coordinated with insulation depths.
      4. Galvanized steel wire roof with 12,000 pound minimum breaking strength. Layout lifeline
         start and end points for a maximum of 100 foot section lengths.
      5. Galvanized swags as required for wire rope terminations.
6. Aborbinator attachment system to provide shock absorption. Provide complete system on each section of lifeline.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.
B. If substrate preparation is the responsibility of another installer, notify Mosaic Architecture of unsatisfactory preparation before proceeding.

3.02 PREPARATION

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

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing weather integrity.

3.04 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION
SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.
B. Firestopping of all joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
B. Section 09 2116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

C. ITS (DIR) - Directory of Listed Products; current edition.
E. FA (AG) - FM Approval Guide; Factory Mutual Research Corporation; current edition.
F. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
C. Product Data: Provide data on product characteristics, performance ratings, and limitations.
D. Sustainable Design Submittal: Submit VOC content documentation for all non-preformed materials.
E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
G. Certificate from authority having jurisdiction indicating approval of materials used.
H. Installer Qualification: Submit qualification statements for installing mechanics.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
   1. Listing in the current-year classification or certification books of UL, FM, or ITS (Warnock Hersey) will be considered as constituting an acceptable test report.
   2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
   3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Approved by Factory Mutual Research Corporation under FM 4991, or meeting any two of the following requirements:
   2. With minimum 3 years documented experience installing work of this type.
   3. Able to show at least 5 satisfactorily completed projects of comparable size and type.
4. Licensed by authority having jurisdiction.

1.06 FIELD CONDITIONS
   A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.
   B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS
   A. Subject to compliance with through penetration firestop systems (XHEZ), joint systems (XHBN) and perimeter firestop systems (XHDG) and any other appropriate section listed in Volume II of the UL Fire Resistance Directory, provide products of one or a combination of the following as required by condition of use:
      1. Hilti Construction Chemicals, Inc.
      2. Tremco Inc.
      3. 3M Fire Protection Products.

2.02 FIRESTOPPING ASSEMBLY REQUIREMENTS
   A. Provide firestopping composed of components that are compatible with each other, the substrates forming openings and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the fire-resistance-rated systems.
   B. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.
   C. Firestopping materials are either "cast-in-place" or "post-installed". Provide cast-in-place firestop devices prior to concrete placement.
   D. Firestopping:
      1. Use only firestop products that have been ASTM E814, UL 1479 or UL 2079 tested and approved for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements and fire-rating involved for each separate instance.
      2. Provide a firestop system with an "F" rating as determined by UL 1479 or ASTM E814 which is equal to the time rating of construction joint assembly.
   E. Sealants, caulking materials or foams for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:
      1. Hilti CP 618 Firestop Putty Stick (non insulated).
      2. Hilti FS-One High Performance Intumescent Firestop Sealant
      3. Hilti FS 620 Fire Foam
      4. 3M Fire Barrier CP25 WB
      5. 3M Fire Stop Sealant 2000
      6. Tremco Tremstop Fire Sil Sealant
      7. Tremco Tremstop IA Intumescent Acrylic Firestop Sealant
   F. Sealants or Caulking materials for use with sheet metal ducts, the following products are acceptable:
      1. Hilti CP 601s Elastomeric Firestop Sealant
      2. Hilti CP 606 Flexible Firestop Sealant
      3. Hilti CP 675 Firestop Board with Accessories
      4. Hilti-FS-ONE Intumescent Firestop Sealant
   G. Sealants, caulking or spray materials for use with fire rated construction joints and other gaps, the following products are acceptable:
      1. Hilti CP 601s Elastomeric Firestop Sealant
2. Hilti CP 606 Flexible Firestop Sealants
3. Hilti CP 604 Self-Leveling Firestop Sealant
4. Hilti CP 675 Firestop Board with Accessories
5. 3M Firestop Sealant 2000
6. Tremco Tremstop Silicone (Frye Sil) Sealant.

H. Pre-formed mineral wool designated to sit flutes of metal profile deck and gap between top of wall and metal profile deck; as a backer for spray material:
   1. Hilti CP 777 Speed Plugs
   2. Hilti CP 767 Speed Strips

I. Intumescent sealants, caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe (closed piping system) the following products are acceptable:
   1. Hilti-FS-ONE Intumescent Firestop Sealant
   2. Tremco Tremstop WBM Intumescent Firestop Sealant

J. Intumescent sealants, caulking materials for use with combustible plastic piping (open piping system), the following materials are acceptable:
   1. Hilti-FS-ONE Intumescent Firestop Sealant
   2. Tremco Tremstop WBM Intumescent Firestop Sealant

K. Foams, intumescent sealants or caulking materials for use with flexible cable or cable bundles, the following products are acceptable:
   1. Hilti FS-ONE Intumescent Firestop Sealant
   2. Hilti CP 620 Fire Foam
   3. Hilti CP 601s Elastomeric Firestop Sealant
   4. Hilti CP 606 Flexible Firestop Sealant

L. Non-curing, re-penetrable intumescent putty or foam materials for use with flexible cable or cable bundles, the following products are acceptable:
   1. Hilti CP 617 Firestop Putty Pad
   2. Hilti CP 618 Firestop Plug

M. Wall opening protective materials for use with UL listed metallic and specified nonmetallic outlet boxes, the following products are acceptable:
   1. Hilti CP 617 Firestop Putty Pad
   2. Hilti CP 618 Firestop Plug

N. Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping system), the following products are acceptable:
   1. Hilti CP 643N Firestop Collar
   2. Hilti CP 644 Firestop Collar
   3. Hilti CP 645/648 Wrap Strips

O. Materials used for large openings and complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busway in raceway, the following products are acceptable:
   1. Hilti CP 637 Firestop Mortar
   2. Hilti FS 657 Fire Block
   3. Hilti CP 620 Fire Foam
   4. Hilti CP 675T Firestop Board
   5. 3M Firestop Foam 2001
   6. 3M Fire Barrier CS 195 Composite Sheet

P. Non-curing, re-penetrable materials used in large size/complex penetrations made to accommodate cable trays and bundles, multiple steel and copper pipes, electrical busways and raceways, the following products are acceptable:
   1. Hilti FS 657 Fire Block
   2. Hilti CP 675T firestop Board
Q. Sealants or caulking materials used in openings between structurally separate sections of wall and floors, use the following products:
   1. Hilti CP 672 Speed Spray
   2. Hilti CP 601s Elastomeric Firestop Sealant
   3. Hilti CP 606 Flexible Firestop Sealant
   4. Hilti CP 604 Self-Leveling Firestop Sealant
   5. Hilti FS ONE High Performance Intumescent Firestop Sealant
   6. 3M Fire Barrier CP 25 WB

R. For blank openings made in fire rated wall or floor assemblies, where future penetration of pipes, conduits or cables is expected, the following products are acceptable:
   1. Hilti FS 657 Fire Block
   2. Hilti CP 658T Firestop Plug

2.03 MATERIALS
   A. Firestopping Sealants: Provide only products having lower volatile organic compound (VOC) content than required by South West Coast Air Quality Management District Rule No. 1168.
   B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing and Accessories: Type required for tested assembly design.

PART 3 EXECUTION
3.01 EXAMINATION
   A. Verify openings are ready to receive the work of this section.
   B. Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

3.02 PREPARATION
   A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that could adversely affect bond of firestopping material.
   B. Remove incompatible materials that could adversely affect bond.
   C. Install backing materials to arrest liquid material leakage.

3.03 INSTALLATION
   A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
   B. Do not cover installed firestopping until inspected by authorities having jurisdiction.
   C. Install labeling required by code.

3.04 CLEANING
   A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION
   A. Protect adjacent surfaces from damage by material installation.

END OF SECTION
SECTION 07 9005
JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Sealants and joint backing.
B. Hollow gaskets.

1.02 RELATED REQUIREMENTS
A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
B. Section 08 8000 - Glazing: Glazing sealants and accessories.
C. Section 09 2116 - Gypsum Board Assemblies: Acoustic sealant.
D. Section 09 3000 - Tiling: Sealant used as tile grout.

1.03 REFERENCE STANDARDS
F. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data indicating sealant chemical characteristics.
C. LEED Report: Submit VOC content documentation for all non-preformed sealants and primers.
   1. VOC Method of Determining VOC Content as Calculated by 40 CFR 59 (EPA Method 24):
      b. Non-Membrane Roof Sealants.
      c. Single Ply Membrane Roof Sealants
      d. Sealants Primers for Non-Porous Substrates
      e. Sealants Primers for Porous Substrates
      f. Modified Bituminous Sealants Primers
D. Manufacturer's Installation Instructions: Indicate special procedures.

1.05 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.06 FIELD CONDITIONS
A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.07 WARRANTY
A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
B. Correct defective work within a five year period after Date of Substantial Completion.
C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.
PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gunnable and Pourable Sealants:
   9. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SEALANTS

A. Sealants and Primers - General: Provide products having volatile organic compound (VOC) content as specified in Section 01 6116.
B. General Purpose Exterior Sealant: Polyurethane; ASTM C920, Grade NS, Class 25 minimum; Uses M, G, and A; single component.
   1. Color: Match adjacent finished surfaces.
   2. Applications: Use for:
      a. Control, expansion, and soft joints in masonry.
      b. Joints between concrete and other materials.
      c. Joints between metal frames and other materials.
      d. Other exterior joints for which no other sealant is indicated.
C. Exterior Expansion Joint Sealer: Precompressed foam sealer; urethane with water-repellent;
   1. Face Color: Match exterior product color.
   2. Size as required to provide weathertight seal when installed.
   3. Provide product recommended by manufacturer for traffic-bearing use.
   4. Applications: Use for:
      a. Exterior wall expansion joints.
D. Exterior Metal Lap Joint Sealant: Butyl or polyisobutylene, nondrying, nonskinning, noncuring.
   1. Applications: Use for:
      a. Concealed sealant bead in sheet metal work.
      b. Concealed sealant bead in siding overlaps.
E. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
   1. Color: To be selected by Mosaic Architecture from manufacturer's standard range.
   2. Applications: Use for:
      a. Interior wall and ceiling control joints.
      b. Joints between door and window frames and wall surfaces.
      c. Other interior joints for which no other type of sealant is indicated.
F. Bathtub/Tile Sealant: White silicone; ASTM C920, Uses I, M and A; single component, mildew resistant.
   1. Applications: Use for:
      a. Joints between plumbing fixtures and floor and wall surfaces.
      b. Joints between kitchen and bath countertops and wall surfaces.
   1. Composition: Permanently tacky non-hardening butyl sealant.
   2. Applications: Use for concealed locations only:
      a. Sealant bead between top stud runner and structure and between bottom stud track and floor.
   1. Color: Color as selected.
   2. Applications: Use for:
      a. Joints in sidewalks and vehicular paving.

2.03 ACCESSORIES
   A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
   B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
   C. Joint Backing: Round foam rod compatible with sealant; ASTM D1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
   D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION
3.01 EXAMINATION
   A. Verify that substrate surfaces are ready to receive work.
   B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION
   A. Remove loose materials and foreign matter that could impair adhesion of sealant.
   B. Clean and prime joints in accordance with manufacturer's instructions.
   C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
   D. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 INSTALLATION
   A. Perform work in accordance with sealant manufacturer’s requirements for preparation of surfaces and material installation instructions.
   B. Perform installation in accordance with ASTM C1193.
   C. Perform acoustical sealant application work in accordance with ASTM C919.
   D. Install bond breaker where joint backing is not used.
   E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
   F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
   G. Tool joints concave.
   H. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.

3.04 CLEANING
   A. Clean adjacent soiled surfaces.

3.05 PROTECTION
   A. Protect sealants until cured.

END OF SECTION
PART 1  GENERAL

1.01  SECTION INCLUDES
   A.  Non-fire-rated hollow metal doors and frames.
   B.  Hollow metal frames for wood doors.
   C.  Fire-rated hollow metal doors and frames.
   D.  Thermally insulated hollow metal doors with frames.
   E.  Hollow metal borrowed lites glazing frames.

1.02  RELATED REQUIREMENTS
   A.  Section 08 7100 - Door Hardware.
   B.  Section 08 8000 - Glazing: Glass for doors and borrowed lites.
   C.  Section 09 9113 - Exterior Painting: Field painting.

1.03  REFERENCE STANDARDS
   D.  ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.
   F.  ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
   J.  BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2014.
   L.  ITS (DIR) - Directory of Listed Products; current edition.
   N.  NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
   O.  NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.
   Q.  NAAMM HMMA 850 - Fire-Protection and Smoke Control Rated Hollow Metal Door and Frame Products; 2014.
W. UL (DIR) - Online Certifications Directory; current listings at database.ul.com.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
D. LEED Submittal:
   1. Product Data for MRc 4.1 and MRc 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.
E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
F. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
B. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes installation requirements.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS
2.01 MANUFACTURERS
A. Hollow Metal Doors and Frames:
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DESIGN CRITERIA
A. Requirements for Hollow Metal Doors and Frames:
   1. Steel used for fabrication of doors and frames shall comply with one or more of the following requirements; Galvannealed steel conforming to ASTM A653/A653M, cold-rolled steel conforming to ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel conforming to ASTM A1011/A1011M, Commercial Steel (CS) Type B for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
4. Door Edge Profile: Manufacturers standard for application indicated.
5. Typical Door Face Sheets: Flush.
7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Exterior Doors: Thermally insulated.
1. Based on NAAMM HMMA Custom Guidelines:
   a. Comply with guidelines of NAAMM HMMA 860 for Hollow Metal Doors and Frames.
   b. Performance Level 2 - Moderate Duty, in accordance with NAAMM HMMA 805.
   c. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
   d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
2. Core Material: Polyurethane, 1.8 lbs/cu ft minimum density.
5. Insulating Value: U-value of 0.50, when tested in accordance with ASTM C1363.
6. Weatherstripping: Refer to Section 08 7100.

B. Interior Doors, Non-Fire Rated:
1. Based on NAAMM HMMA Custom Guidelines:
   a. Comply with guidelines of NAAMM HMMA 860 for Hollow Metal Doors and Frames.
   b. Performance Level 1 - Light Duty, in accordance with NAAMM HMMA 805.
   c. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
   d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
2. Core Material: Manufacturers standard core material/construction and in compliance with requirements.

C. Fire-Rated Doors:
1. Based on NAAMM HMMA Custom Guidelines: Comply with NAAMM HMMA 850 requirements for fire-rated doors.
   a. Comply with guidelines of NAAMM HMMA 860 for Hollow Metal Doors and Frames.
   b. Performance Level 1 - Light Duty, in accordance with NAAMM HMMA 805.
   c. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
   d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
   a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
   b. Attach fire rating label to each fire rated unit.
3. Core Material: Manufacturers standard core material/construction in compliance with requirements.
D. Panels: Same construction, performance, and finish as doors.

2.04 HOLLOW METAL FRAMES
A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
B. General:
1. Comply with the requirements of grade specified for corresponding door.
   a. ANSI A250.8 Level 1 Doors: 16 gage frames.
   b. Frames for Wood Doors: Comply with frame requirements specified in ANSI A250.8 for Level 1, 18 gage
2. Finish: Same as for door.
3. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
4. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.
5. Frames Wider than 48 Inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

C. Exterior Door Frames: Face welded type.
1. Weatherstripping: Separate, see Section 08 7100.

D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
1. Terminated Stops: Provide at interior doors; closed end stop terminated 6 inch, maximum, above floor at 45 degree angle.

E. Door Frames, Fire-Rated: Face welded type.
1. Fire Rating: Same as door, labeled.

F. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

G. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

2.05 ACCESSORIES
A. Glazing: As specified in Section 08 8000, factory installed.
B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
C. Astragals for Double Doors: Specified in Section 08 7100.
1. Fire-Rated Doors: Steel, shape as required for fire rating.
D. Grout for Frames: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.
E. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.

2.06 FINISHES
A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify existing conditions before starting work.
B. Verify that opening sizes and tolerances are acceptable.
C. Verify that finished walls are in plane to ensure proper door alignment.
3.02 PREPARATION
   A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 INSTALLATION
   A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
   B. Install fire rated units in accordance with NFPA 80.
   C. Coordinate frame anchor placement with wall construction.
   D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
   E. Coordinate installation of hardware.
   F. Coordinate installation of glazing.
   G. Coordinate installation of electrical connections to electrical hardware items.
   H. Touch up damaged factory finishes.

3.04 TOLERANCES
   A. Clearances Between Door and Frame: Comply with related requirements of specified door and frame standards or custom guidelines indicated.
   B. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

3.05 ADJUSTING
   A. Adjust for smooth and balanced door movement.

3.06 SCHEDULE
   A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
A. Overhead sectional doors, electrically operated.
B. Operating hardware and supports.
C. Electrical controls.

1.02 RELATED REQUIREMENTS
A. Section 05 5000 - Metal Fabrications: Steel channel opening frame.
B. Section 07 9005 - Joint Sealers: Perimeter sealant and backup materials.

1.03 REFERENCE STANDARDS
C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.
C. Product Data: Show component construction, anchorage method, and hardware.
D. LEED Submittal:
   1. Product Data for MRc4.1 and MRc4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.
E. Manufacturer's Installation Instructions: Include any special procedures required by project conditions.
F. Operation Data: Include normal operation, troubleshooting, and adjusting.
G. Maintenance Data: Include data for motor and transmission, shaft and gearing, lubrication frequency, spare part sources.
H. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 WARRANTY
A. See Section 01 7800 - Closeout Submittals for warranty requirements.
B. Warranty: Manufacturer's limited door and operators System warranty for 10 year against delamination of polyurethane foam from steel face and all other components for 3 years or 20,000 cycles, whichever comes first.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Sectional Doors - Acceptable Manufacturer: Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: sales@overheaddoor.com.
   1. Overhead Door Thermacore Model 596.
B. Acceptable Manufacturers:
3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 INSULATED SECTIONAL OVERHEAD DOORS

A. Insulated Steel Sectional Overhead Doors: 596 Series Thermacore Insulated Steel Doors by Overhead Door Corporation. Units shall have the following characteristics:

1. Door Assembly: Metal/foam/metal sandwich panel construction, with PVC thermal break and weather-tight ship-lap design meeting joints.
   a. Panel Thickness: 2 inches (51 mm).
   c. Exterior Steel: 20 gauge, galvanized.
   d. End Stiles: 16 gauge with thermal break.
   e. Spring Counterbalance: Sized to weight of the door, with a helically wound, oil tempered torsion spring mounted on a steel shaft; cable drum of diecast aluminum with high strength galvanized aircraft cable. Sized with a minimum 7 to 1 safety factor.
      1) Standard cycle spring: 10,000 cycles.
   f. Insulation: CFC-free and HCFC-free polyurethane, fully encapsulated.
   g. Thermal Values: R-value of 17.40; U-value of 0.057.
   h. Air Infiltration: 0.08 cfm at 15 mph; 0.08 cfm at 25 mph.
   i. Sound Transmission: Class 26.
   j. Partial Glazing of Steel Panels:
      1) Aluminum Sash Section with DSB Glazing.

2. Finish and Color:
   a. To be chosen from manufacturer's range of colors.

3. Windload Design: Provide to meet the Design/Performance requirements specified.


5. Lock:
   a. Interior mounted slide lock with interlock switch for automatic operator.

6. Weatherstripping:
   a. EPDM bulb-type strip at bottom section.
   b. Flexible Jamb seals.
   c. Flexible Header seal.

7. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.
   a. Size: 2 inch.
   b. Type: High Lift.

8. Electric Motor Operation: Provide UL listed electric operator, size and type as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second. Operator shall meet UL325/2010 requirements for continuous monitoring of safety devices.
   a. Entrapment Protection: Required for momentary contact, includes radio control operation.
      1) Pneumatic sensing edge up to 18 feet (5.5 m) wide. Constant contact only complying with UL 325/2010.
   b. Operating Controls:
      1) Push-button operated control stations with open, close, and stop buttons.
      2) Surface mounting.
      3) Interior location.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until openings have been properly prepared.
B. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.
C. Verify that electric power is available and of the correct characteristics.
D. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION
A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.
B. Apply primer to wood frame.

3.03 INSTALLATION
A. Install door unit assembly in accordance with manufacturer's instructions.
B. Anchor assembly to wall construction and building framing without distortion or stress.
C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
D. Fit and align door assembly including hardware.
E. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.
F. Install perimeter trim and closures.

3.04 TOLERANCES
A. Maximum Variation from Plumb: 1/16 inch.
B. Maximum Variation from Level: 1/16 inch.
C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 ft straight edge.
D. Maintain dimensional tolerances and alignment with adjacent work.

3.05 ADJUSTING
A. Adjust door assembly for smooth operation and full contact with weatherstripping.
B. Have manufacturer's field representative present to confirm proper operation and identify adjustments to door assembly for specified operation.

3.06 PROTECTION
A. Protect installed products from damage until Date of Substantial Completion.
B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION
SECTION 08 4313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Aluminum-framed storefront, with vision glass.
B. Aluminum doors and frames.
C. Weatherstripping.
D. Perimeter sealant.

1.02 ALUMINUM ALUMINUM STOREFRONT SYSTEM
A. Kawneer Trifab VG 451T Storefront System: 2" x 4-1/2" nominal dimension; Thermal; Front, Multi-Plane, Structural Silicone or Weatherseal Glazed; Screw Spline, Shear Block.

1.03 RELATED REQUIREMENTS
A. Section 07 9005 - Joint Sealers: Perimeter sealant and back-up materials.
B. Section 08 7100 - Door Hardware: Hardware items other than specified in this section.

1.04 REFERENCE STANDARDS
A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

1.05 PERFORMANCE REQUIREMENTS
A. Design and size components to withstand the following load requirements without damage or permanent set, when tested in accordance with ASTM E 330, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
   2. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
B. Movement: Accommodate movement between storefront and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.

C. Air Infiltration: Limit air infiltration through assembly to 0.06 cu ft/min/sq ft of wall area, measured at a reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E 283.

D. Water Leakage: None, when measured in accordance with ASTM E 331 with test pressure difference of 2.86 lbf/ sq ft.

E. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

F. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glass and inner sheet of infill panel and heel bead of glazing compound.

G. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.

1.06 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details and ________.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

D. LEED Submittal:
1. Product Data for MRc 4.1 and MRc 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.

E. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.

F. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

G. Samples: Submit two samples illustrating finished aluminum surface, glass, infill panels, glazing material.

H. Manufacturer’s Certificate: Certify that the products supplied meet or exceed the specified requirements.

I. Warranty: Submit manufacturer warranty and ensure forms have been completed in MSU Facilities’s name and registered with manufacturer.

1.07 QUALITY ASSURANCE
A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at Montana.

B. Manufacturer and Installer Qualifications: Company specializing in manufacturing aluminum glazing systems with minimum three years of documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING
A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.
1.09 FIELD CONDITIONS
   A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.10 WARRANTY
   A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
   B. Correct defective Work within a five year period after Date of Substantial Completion.
   C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
   D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURERS
   A. Aluminum-Framed Storefront and Doors:
         a. Basis of Design Product:
            1) Trifab VG 451T Storefront System.
            2) 2" x 4-1/2" System Dimension
            3) Glass: Exterior Glazed
            4) Frame extrusion and internal reinforcement to allow spans as indicated on drawings.
      6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS
   A. Extruded Aluminum: Alloy and temper recommended by aluminum storefront manufacturer for strength, corrosion resistance, and application of required finish and not less than 0.070" wall thickness at any location for the main frame and complying with ASTM B 221: 6063-T6 alloy and temper.
   B. Fasteners: Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim hardware, anchors and other components.
   C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel or zinc coated steel or iron complying with ASTM B 663 or SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
   D. Reinforcing Members: Aluminum, nonmagnetic stainless steel or zinc coated steel or iron complying with ASTM B 663 or SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
   E. Reinforcing Members: Aluminum, nonmagnetic stainless steel, or nickel/chrome plated steel complying with ASTM B 633 for Type SC 3 severe service conditions, or zinc coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions or other suitable zinc coating, provide sufficient strength to withstand design pressure indicated.
   F. Sealant: For sealants required within fabricated storefront system, provide permanently elastic, non-shrinking and non-migrating type recommended by sealant manufacturer for joint size and movement.
   G. Tolerances: Reference to tolerance for wall thickness and other cross-sectional dimensions of storefront members are nominal and in compliance with AA aluminum standards and data.
2.03 STOREFRONT FRAMING SYSTEM

A. Thermal Barrier (Trifab VG 451T):
   1. Kawneer Isolock Thermal Break with 1/4 inch separation consisting of a two part chemically curing, high density polyurethane, which is mechanically and adhesively joined to aluminum storefront sections.
      a. Thermal Break shall be designed in accordance with AAMA TIR-A8 and tested in accordance with AAMA 505.

B. Brackets and Reinforcement: Manufacturer's standard high strength aluminum with nonstaining, nonferrous shims aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion resistant, non staining, non bleeding fasteners and accessories compatible with adjacent materials. Where exposed shall be stainless steel.

D. Perimeter Anchors: When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

E. Packing, shipping, handling and unloading: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

F. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle storefront material and components to avoid damage. Protect storefront material against damage from elements, construction activities and other hazards before, during and after storefront installation.

G. Doors: Glazed aluminum.
   2. Top Rail: 6 inches wide.
   5. Glazing Stops: Square
   6. Finish: Same as storefront.

2.04 MATERIALS


C. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.

D. Fasteners: Galvanized steel.

E. Exposed Flashings: 0.032 inch thick aluminum sheet; finish to match framing members.

F. Concealed Flashings: 0.018 inch thick galvanized steel.

G. Perimeter Sealant: Specified in Section 07 9005.

H. Glass: As specified in Section 08 8000.

I. Glazing Gaskets: type to suit application to achieve weather, moisture, and air infiltration requirements:
   1. Structural Sealant: ASTM C 1184, single component neutral curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by a structural sealant manufacturer for use in aluminum framed system s indicated.
   2. Weatherseal Sealant: ASTM C 920 for Type S, Grade NS, Class 25, uses NT, G, A and O; single component neutral curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural sealant; weatherseal-sealant, and aluminum framed system manufacturers for this use.

J. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.
2.05 FINISHES
A. AAMA 2605 Permafluor Architectural Finish; **Charcoal color**
B. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.06 HARDWARE
A. Door Hardware: As specified in Section 08 7100.
B. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
C. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.
D. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors.

2.07 FABRICATION
A. Framing Members: Fabricate components that, when assembles, have the following characteristics:
   1. Profiles that are sharp, straight and free of defects or formations.
   2. Accurately fit joints, make joints flush, hairline and weatherproof.
   3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
   4. Physical and thermal isolation of glazing from framing members.
   5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
   7. Fasteners, anchors and connection devices that are concealed from view to greatest extent possible.
B. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
C. Structural Sealant Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
D. Storefront Framing: Fabricate components for assembly using manufacturer's standard installation instructions.
E. After fabrication, clearly mark components to identify their locations in project according to shop drawings.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify dimensions, tolerances, and method of attachment with other work.
B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION
A. Install wall system in accordance with manufacturer's instructions.
B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
C. Provide alignment attachments and shims to permanently fasten system to building structure.
D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
E. Provide thermal isolation where components penetrate or disrupt building insulation.
F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
H. Coordinate attachment and seal of perimeter air and vapor barrier materials.
I. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
J. Install operating sash.
K. Set thresholds in bed of sealant and secure.
L. Install hardware using templates provided.
M. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES
A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 ft, whichever is less.
B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 ADJUSTING
A. Adjust operating hardware and sash for smooth operation.

3.05 CLEANING
A. Remove protective material from pre-finished aluminum surfaces.
B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
C. Remove excess sealant by method acceptable to sealant manufacturer.

END OF SECTION
MSU NEW DINING HALL

SECTION 084113 – ALUMINUM DOOR HARDWARE

1.1 ALUMINUM DOOR HARDWARE SCHEDULE

FINISHES: Hardware BRUSHED STAINLESS – Alum #40 AAM12C22A44

HARDWARE GROUP #A1 - EXTERIOR ALUMINUM ENTRY EXTERIOR DOORS w OPERATOR

1 EA HINGES: HAGER 780-112HD ROTHON GEARED CONTINUOUS HINGE
1 EA LOW POWER ASSIST OPERATOR/CLOSER, ANSI A156.19 WITH ACTUATORS (SLAP PLATE TYPE): LCN 4640 SERIES
1 EA PANIC DEVICES RIM STRIKE, ANSI A156.3, GRADE 1 WITH LEVER TRIM AND DOGGING
1 EA SWEEPS - PILE BRUSH TYPE
1 SET GASKET X LF OPENING
1 EA THRESHOLD X WIDTH OF OPENING - 1/2” MAX HEIGHT
1 EA CYLINDERS, BY HARDWARE SECTION, SCHLAGE PRIMUS GROUP 9
1 EA POWER SUPPLY
1 EA DOOR ACCESSIBILITY SIGN

HARDWARE GROUP #A2 - EXTERIOR ALUMINUM ENTRY EXTERIOR DOORS

1 EA HINGES: HAGER 780-112HD ROTHON GEARED CONTINUOUS HINGE
1 EA CLOSER HEAVY DUTY ANSI A156.4, GRADE 1
1 EA PANIC DEVICES RIM STRIKE, ANSI A156.3, GRADE 1 WITH LEVER TRIM AND DOGGING
1 EA SWEEPS - PILE BRUSH TYPE
1 SET GASKET X LF OPENING
1 EA THRESHOLD X WIDTH OF OPENING - 1/2” MAX HEIGHT
1 EA CYLINDERS, BY HARDWARE SECTION, SCHLAGE PRIMUS GROUP 9
1 EA POWER SUPPLY

HARDWARE GROUP #A3 - EXTERIOR ALUMINUM DOUBLE ENTRY INTERIOR DOORS

2 EA HINGES: HAGER 780-112HD ROTHON GEARED CONTINUOUS HINGE
1 EA LOW POWER ASSIST OPERATOR/CLOSER, ANSI A156.19 WITH ACTUATORS (SLAP PLATE TYPE): LCN 4640 SERIES
1 EA CLOSER HEAVY DUTY ANSI A156.4, GRADE 1
4 EA PUSH BAR: 1” x 24” LOOP PULLS
1 EA DOOR ACCESSIBILITY SIGN

HARDWARE GROUP #A4 – EXTERIOR ALUMINUM EXIT ONLY

1 EA HINGES: HAGER 780-112HD ROTHON GEARED CONTINUOUS HINGE
1 EA CLOSER HEAVY DUTY, ANSI A156.4, GRADE 1
<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 EA</td>
<td>PANIC DEVICES RIM STRIKE, ANSI A156.3, GRADE 1 WITH LEVER TRIM AND DOGGING</td>
</tr>
<tr>
<td>1 EA</td>
<td>SWEEPS - PILE BRUSH TYPE</td>
</tr>
<tr>
<td>1 SET</td>
<td>GASKET X LF OPENING</td>
</tr>
<tr>
<td>1 EA</td>
<td>THRESHOLD X WIDTH OF OPENING- 1/2” MAX HEIGHT</td>
</tr>
<tr>
<td>1 EA</td>
<td>DOOR ACCESSIBILITY SIGN</td>
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**HARDWARE GROUP #A5- SINGLE EXTERIOR ALUM**

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<tr>
<td>1 EA</td>
<td>CLOSER (HEAVY DUTY) ANSI A156.4, GRADE 1</td>
</tr>
<tr>
<td>1 EA</td>
<td>PANIC DEVICES CONCEALED VERTICAL ROD, ANSI A156.3, GRADE 1 WITH LEVER TRIM AND DOGGING</td>
</tr>
<tr>
<td>1 SET</td>
<td>GASKET X LF OPENING</td>
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<td>THRESHOLD X WIDTH OF OPENING</td>
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<td>SWEEP BRUSH PILE TYPE</td>
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**HARDWARE GROUP #A6- SINGLE EXTERIOR ALUM ENTRY**

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<tr>
<td>1 EA</td>
<td>CLOSER (HEAVY DUTY) ANSI A156.4, GRADE 1</td>
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<tr>
<td>1 EA</td>
<td>PANIC DEVICES CONCEALED VERTICAL ROD, ANSI A156.3, GRADE 1 WITH LEVER TRIM AND DOGGING</td>
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<tr>
<td>1 SET</td>
<td>GASKET X LF OPENING</td>
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<td>THRESHOLD X WIDTH OF OPENING</td>
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**HARDWARE GROUP #A7- SINGLE INTERIOR ALUMINUM**

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<td>HINGES - 4.5X4.5-NRP</td>
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<tr>
<td>1 EA</td>
<td>CLASSROOM LOCKSET (SC) ND70PD – OME – 619 ANSI F86</td>
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<tr>
<td>1 EA</td>
<td>SEALS</td>
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<tr>
<td>1 EA</td>
<td>WALL STOP</td>
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**HARDWARE GROUP #A8- SINGLE INTERIOR ALUMINUM EXIT**

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<td>HINGES: HAGER 780-112HD ROTON GEARED CONTINUOUS HINGE</td>
</tr>
<tr>
<td>1 EA</td>
<td>CLOSER (HEAVY DUTY) ANSI A156.4, GRADE 1</td>
</tr>
<tr>
<td>1 EA</td>
<td>PANIC DEVICES CONCEALED VERTICAL ROD, ANSI A156.3, GRADE 1 WITH LEVER TRIM AND DOGGING</td>
</tr>
<tr>
<td>1 SET</td>
<td>GASKET X LF OPENING</td>
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SECTION 08 4413
GLAZED ALUMINUM CURTAIN WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed curtain wall, with vision glazing and glass infill panels.
B. Perimeter sealant.

1.02 RELATED REQUIREMENTS

A. Section 05 1200 - Structural Steel Framing: Steel attachment members.
B. Section 07 9005 - Joint Sealers: Perimeter sealant and back-up materials.
C. Section 08 4313 - Aluminum-Framed Storefronts: Entrance framing and doors.
D. Section 09 2116 - Gypsum Board Assemblies: Metal stud and gypsum board wall at interior of curtain wall.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.
M. ASTM E413 -Classification for Rating Sound Insulation; 2010.
O. SSPC-Paint 25 - Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel, Type I and Type II; Society for Protective Coatings; 1997 (Ed. 2004).

1.04 PERFORMANCE REQUIREMENTS

A. Design and size components to withstand the following load requirements without damage or permanent set:
   1. Positive Design Wind Load: 40 lbf/sq ft.
   2. Negative Design Wind Load: 40 lbf/sq ft.
3. Deflection: No deflection in excess of L/175 of the span of any framing member at design load. At structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in framing members in excess of 1.2% of their clear spans shall occurs.
4. Measure performance by testing in accordance with ASTM E 330, using test loads equal to 1.5 times the design wind loads and 10 second duration of maximum pressure.

B. Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with building code and as indicated on structural drawings.

C. Movement: Accommodate the following movement without damage to components or deterioration of seals:
   1. Movement to curtain wall relative to perimeter framing.
   2. Deflection of structural support framing, under permanent and dynamic loads.

D. Thermal Resistance (U Factor): When tested to AAMA Specification 1503, the thermal transmittance (U Factor) shall be not more than 0.43.

E. Air Infiltration: Limit air infiltration through assembly to 0.60 cu ft/min/sq ft of wall area, measured at a reference differential pressure across assembly of 6.24 psf (300 Pa) as measured in accordance with ASTM E 283.

F. Condensation Resistance Factor: CRF of 71 for frame, 71 for Low-E glass when measured in accordance with AAMA 1503.1.

G. Water Leakage: None, when measured in accordance with ASTM E 331 at a test pressure difference of 12 lbf/sq ft (575 Pa) as defined in AAMA 501.

H. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occuring in glazing channel, and migrating moisture occuring within system.

I. Sound Attenuation: STC of 31m minimum, from exterior to interior, calculated in accordance with ASTM E 413, tested in accordance with ASTM E 90, ASTM E 1425.

J. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.

K. Design system to eliminate noises caused by wind and thermal movement, to prevent vibration harmonics, and to prevent "stack effect" in internal spaces.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, internal drainage details, glazing, and infill.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

D. Product Data for MRc 4.1 and MRc 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.

E. LEED Submittal:
   1. Product Data for MRc 4.1 and MRc 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.

F. Test Reports: Submit results of full-size mock-up testing. Reports of tests previously performed on the same design are acceptable.

G. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure.
H. Field Quality Control Submittals: Report of field testing for water leakage.
I. Warranty: Submit manufacturer warranty and ensure forms have been completed in MSU Facilities’s name and registered with manufacturer.

1.06 QUALITY ASSURANCE
A. Manufacturer and Installer Qualifications: Company specializing in manufacturing aluminum glazing systems with minimum three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Handle products of this section in accordance with AAMA CW-10.
B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 WARRANTY
A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
B. Correct defective Work within a five year period after Date of Substantial Completion.
C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 MANUFACTURER
A. Kawneer Company, Inc. www.kawneer.com
   1. Product: Series 1600 Wall Series.
   2. Finish Color: Charcoal
B. Other Acceptable Manufacturer’s:
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COMPONENTS
A. Aluminum-Framed Curtain Wall: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   2. Color: Charcoal in color.
B. Aluminum Framing Member: Tubular aluminum sections, thermally broken from the interior section insulated from the exterior, drainage holes and internal weep drainage system.
   1. Framing members for interior applications need not be thermally broken.
   2. Cross-Section: As indicated on drawings.
C. Doors: Glazed Aluminum
   2. Top Rail: 6 inches wide.
   5. Glazing Stops: Beveled.
   6. Finish: Same as curtain wall.

2.03 MATERIALS
A. Extruded Aluminum: ASTM B 221 (ASTM B 221M), 6063-T5 or T6 alloy.
B. Structural Temper Steel Sections: ASTM A 36/A 36M; galvanized in accordance with requirements of ASTM A 123/A 123M.
C. Structural Supporting Anchors Attached to Structural Steel: Design for bolted attachment.
D. Fasteners: Galvanized steel.
E. Exposed Fasteners: 0.032 inch thick aluminum sheet; finish to match framing members.
F. Concealed Flashing: 0.018 inch thick galvanized adhesive.
G. Weatherseal Sealant: Silicone, same as glazing adhesive.
H. Perimeter Sealant: Specified in Section 07 9000.
I. Glazing: As specified in Section 08 8000.
J. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
K. Glazing Accessories: As specified in Section 08 8000.
L. Touch-up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.04 FINISHES
A. AAMA 2605 Permafluor Architectural Finish; Charcoal color.

2.05 SOURCE QUALITY CONTROL
A. Source Quality: Provide aluminum curtain walls specified herein from a single source.
   1. Building Enclosure System: When aluminum curtain wall are part of the building enclosure system, including entrances, entrance hardware, windows, storefront framing and related products, provide building enclosure system products from a single source manufacturer.
   2. High Performance Organic Finish: AAMA 2604; multiple coats, thermally cured fluoropolymer system; color as scheduled.

2.06 FABRICATION
A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
C. Prepare components to receive anchor devices. fabricate anchors.
D. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
E. Arrange fasteners and attachments to conceal from view.
F. Reinforce framing members for imposed loads.
G. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.
   1. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify dimensions, tolerances, and method of attachment with other related work.
B. Verify that curtain wall openings and adjoining air and vapor seal materials are ready to receive work of this section.
C. Verify that anchorage devices have been properly installed and located.

3.02 INSTALLATION
A. Install curtain wall system in accordance with manufacturer's instructions.
B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
C. Provide alignment attachments and shims to permanently fasten system to building structure.
D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
E. Provide thermal isolation where components penetrate or disrupt building insulation.
F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
G. Coordinate attachment and seal of perimeter air and vapor barrier materials.
H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
I. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES
A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.
B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.
C. Sealant Space Between Curtain Wall Mullions and Adjacent Construction: Maximum of 3/4 inch and minimum of 1/4 inch.

3.04 ADJUSTING
A. Adjust operating sash for smooth operation.

3.05 CLEANING
A. Remove protective material from pre-finished aluminum surfaces.
B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

END OF SECTION
SECTION 08 7100
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood, aluminum, and hollow metal doors.
B. Hardware for fire-rated doors.
C. Electrically operated and controlled hardware.
D. Lock cylinders for doors that hardware is specified in other sections.
E. Thresholds.
F. Weatherstripping, seals and door gaskets.

1.02 DESCRIPTION OF WORK

A. Definition: "Finish Hardware" includes items known commercially as finish hardware which are required for swing, sliding and folding doors, except special types of unique and non-matching hardware specified in the same section as the door and door frame.
B. Extent of finish hardware required is indicated on drawings and in schedule.
C. Types of finish hardware required include the following:
   1. Butt Hinges.
   2. Continuous Hinges
   3. Lock Cylinders and Keys.
   4. Lock and latch Sets.
   5. Dead Bolts.
   6. Exit Devices
   7. Door Closers.
   10. ADA Power Actuators.
   11. Overhead holders
   12. Door trim Units
D. Hardware must be in strict compliance with NW Energy standards.

1.03 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames.
B. Section 08 1416 - Flush Wood Doors.
C. Section 08 4313 - Aluminum-Framed Storefronts: Hardware for same except cylinders; installation of cylinders.
D. Section 08 4413 - Glazed Aluminum Curtain Walls: Hardware for integral doors and frames except lock cylinders; installation of cylinders.

1.04 QUALITY ASSURANCE

A. Manufacturer: Obtain each type of hardware (latch and locksets) from a single manufacturer.
B. Supplier: A recognized architectural finish hardware supplier, with warehousing facilities, who have been furnishing hardware in the projects vicinity for a period of not less than 2 years and who is, or who employs an experienced architectural hardware consultant who is available, at reasonable times during the course of the work, for consultation about projects hardware requirements, to Owner, Architect or Contractor.
C. Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard 80 and local building code requirements. Provide only hardware which has been tested and listed by UL or an approved testing agency for types and sizes of doors required and complies with requirements of door and door frame labels.
D. Where emergency exit devices are required on fire-rated doors (with supplementary marking on doors with labels indicating "Fire Door to be Equipped with Fire Exit Hardware" provide labels on exit devices indicating "Fire Exit Hardware".

E. The supplier shall be responsible to field check existing openings for proper application of sizes and strikes for all openings.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Hardware Schedule: Submit final hardware schedule in a vertical format as recognized by the Door and Hardware Institute (DHI). Horizontal schedule format will not be accepted. Coordinate hardware with doors, frames and related work to ensure proper size, thickness, hand, function and finish hardware.

1. Final Hardware Schedule Content: Based on finish hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door opening. Include the following information:
   a. Type, style, function, size and finish of each hardware item.
   b. Name and manufacturer of each item.
   c. Fastening and other pertinent information.
   d. Index to include location of hardware set cross-referenced to indications on drawings both on floor plans and in door and frame schedule.
   e. Explanation of all abbreviations, symbols, codes contained in schedule.
   f. Mounting location for hardware.
   g. Door and frame size and materials.
   h. Keying information.
   i. Wiring diagrams with theory operation.

C. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

D. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Montana State University name and registered with manufacturer.

E. LEED Submittals:
   1. Product Data for MRc 4.1 and MRc 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.

1.06 PRODUCT HANDLING

A. Tag each item or package separately with identification related to final hardware schedule and include basic installation instructions with each type or package.

B. Inventory hardware jointly with representatives of hardware installer until each is satisfied that count is correct.

C. Deliver individually packaged hardware items at the proper times to the proper locations for installation.

D. Provide secure lock-up for hardware delivered to the project but not yet installed.

1.07 "OR EQUAL" PROVISION

A. The contractor shall be responsible for supplying the primary product listed as the quality standard or model, which is equal to the primary specified model in regards to specified function, quality, finish, sizes, accessories, options, durability, warranty, parts availability and listing approvals. If it is determined by the Architect at anytime during bidding, construction or installation and prior to final acceptance that the equal model submitted by the contractor is not equal to the primary specified model, the contractor shall assume all costs to replace the model submitted, with an approved equal submitted.
B. The bidders shall submit a list in their bids providing manufacturer and model for all equipment in this section, which they propose to provide. The Architect will determine if the items proposed meet the quality standards set by the specification.

PART 2 PRODUCTS

2.01 SCHEDULED HARDWARE

A. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of finish hardware is indicated in the Finish Hardware Data Sheet and Hardware Schedule at the end of this section. Products are identified by using hardware designation numbers of the following:

1. Manufacturer's Product Designation:
   a. Butt Hinges: McKinney, Stanley or Hager
   b. Continuous Hinges: Hager
   c. Locksets: Schlage
   d. Exit Devices: Von Duprin
   e. Closers: LCN
   f. Overhead Holders: Glynn-johnson
   g. Kickplates: ives
   h. Floor/Wall Stops: Ives
   i. Threshold/Weatherstrip: National Guard Products, Pemko

2.02 MATERIALS AND FABRICATION

A. MSU General Requirements:
   1. All lockset will be of lever type
   2. Shape of lever shall be easy to grasp with one hand and not require tight grasping, tight pinching, or twisting of wrist.
   3. Provide each lockset with a curved lip strike 4 7/8" X 1 1/8" conform to ANSI A115.2. Finish shall match.
   4. Provide locks and cylinders that will accept the small format 7 pin Medeco Keymark X4 interchangeable cores. For room remodels, match the existing keys system in the room. If during a room renovation you need to re-key the entire building, then Provide locks and cylinders that will accept the small format 7 pin Medeco Keymark X4 interchangeable cores.
   5. Hardware supplier and/or Contractor to supply and install construction cores that will fit into the permanent locks and/or cylinders
   6. Contractor will supply to Montana State University (MSU) Locksmith shop with a copy of the construction core master and core key.
   7. Contractor will supply 3 keys per permanent core to be cut as directed by the MSU Locksmith Shop and to be delivered to the MSU Locksmith.
   8. Contractor will turn over to MSU locksmith shop throw member for installed locks/cylinders.
   9. Provide small format 7 pin Medeco Keymark X4 interchangeable permanent cores pinned as specified by Montana State University Locksmith shop.
   10. Cores are to shipped to Montana State University Locksmith Shop.
   11. Mounted at the appropriate height per ADA.
   12. Montana State University Locksmith is to install permanent cores.
   13. Electrified locks and exit devices shall be preferred over electric strikes. Electrified locks afford better security then electric strikes and this type of hardware allows for greater flexibility when making functional changes to openings in the future.
   14. All door/hardware/electrical equipment must be accessible (i.e. The lock power supply must be accessible and the door to power supply must be accessible and allow the door to fully open.)
   15. Exit devices outside trim to be equipped with levers.
   16. All Hardware is to be installed per manufacturer’s specifications.
2.03 HINGES, BUTT
A. Are to be a minimum of three ball bearing butt.
B. Are to be at least 4.5x4.5.
C. Hinges on outside door are to be a non-removable pin.
D. Aluminum doors to use a Heavy duty concealed geared continuous hinge.
E. No pivots are to be used on aluminum doors.
F. Acceptable Manufacturers:
   1. Stanley
   2. McKinney
   3. Hager

2.04 CONTINUOUS HINGES
A. Hinge shall be pinless assembly of three interlocking extrusions applied to the full height of the
door and frame without mortising. The door leaf and jamb leaf shall be geared together for the
entire length of the hinge with visible knuckle separations are not acceptable. Vertical door
loads shall be carried on minimum 3/4” acetal bearings through a full 180 degrees. The door
leaf and jamb leaf shall have a templated screw hole locations for future replacement need. All
heavy duty hinges shall have a minimum of 32 bearings for a 7'-0" length.
B. Acceptable Manufacturer:
   1. Select Products
   2. Hager roton
   3. Markar

2.05 CYLINDRICAL LOCKSET
A. Lockset must be extra heavy-duty.
B. Backset 2 ¾ inch or greater as need to accommodate frame, door or other hardware, with a
   9/16 inch throw latch bolt.
C. Lockset provide for 7 pin interchangeable core for the Medeco Keymark X4.
D. Lockset to have solid shank with no opening for access to keyed lever keeper.
E. Keyed lever to be removable only after core is removed by authorized control key, to allow
   access to lever keeper.
F. Lockset and latches must conform to ANSI A156.2 Series 4000, Grade 1, and be UL listed.
G. All locksets shall be provided with a lever as per American Disabilities Act (ADA) requirements.
   2. Preferred alternative: Schlage ND Series, Rhodes Trim

2.06 DEAD BOLT TUBULAR
A. No exposed mounting screw on exterior.
B. Full 1” stainless steel throw deadbolt.
C. Free turning, wrench-resistant, tapered cylinder ring.
D. Self-aligning.
E. Field reversible.
F. Backset 2 ¾ inch or greater as need to accommodate frame, door or other hardware.
G. ADA turn lever on interior.
H. Accommodates 7 pin interchangeable core for the Medeco Keymark X4.
I. Conform to ANSI A156.5-1992 Auxiliary Locks, Grade 1 and be UL listed.
   1. Preferred: Best 83T Deadbolt.
   2. Preferred alternative: Schlage B600 Deadbolt
2.07 CYLINDER
A. Are to accept the small format 7 pin Medeco Keymark X4 interchangeable core.
B. Are to have the proper tailpiece or cam for correct operation of lock.
   1. Preferred: Best Cylinder.
   2. Preferred Alternative: Medeco Keymark, Arrow, Falcon

2.08 CLOSERS AND DOOR CONTROL DEVICES
A. General Requirements:
   1. All manual closers shall carry a manufacturers ten (10) year warranty.
   2. All closers with electrical components shall carry a manufacturers two (2) year warranty.
   3. Fully hydraulic, rack and pinion action with high strength cast iron cylinders and one piece forged steel pistons.
   4. Fluid of a type requiring no seasonal adjustments.
   5. Hydraulic regulation controlled by tamper-proof, non-critical screw valves, adjustable with a hex wrench.
   6. Separate adjustments for backcheck, general speed, and latch speed.
   7. Closing power of non-sized cylinders shall be adjustable over a range of sizes.
   8. All closers for openings that must meet the minimum requirements of the ADA act.
   9. All manual closers shall provide or be adjustable to less than 5 pounds opening force on a 36" door leaf and delay closing time in accordance with the ADA.
   10. All automatic operator systems shall include the following features and functions.
       a. Provisions for separate conduits to carry high and low voltage wiring in compliance with the National Electrical Code, section 725-31.
       b. The operator will be designed to prevent damage to the mechanism if the system is actuated while the door is latched or if the door is forced closed during the opening cycle.
   11. Installation shall be in accordance with the templates and installation instructions packaged with the closers at the time of manufacture.
   12. Installation shall be made with fasteners packaged with the closer by the manufacturer.
   13. All electrical connections shall be made in accordance with the manufacturer’s recommendations.
   14. Clean installed closer to remove dirt, debris, and marks incidental to installation work.
   15. Installation instructions, service manual and templates are to be turned over to the MSU Locksmith Shop upon completion of the installation work.
   16. Install and regulate all closers in accordance with the installation instructions packaged with the closers at the time of manufacture.
       a. Preferred: LCN 4040XP
       b. Preferred Alternative: Stanley ODC 100 Series

B. All electrohydraulic automatic operators shall include the following features or functions:
   1. Low-speed and low energy movement of the door leaf, making safety pads and/or guard rails unnecessary.
   2. Manual operation of the door without power assistance, permitting the continued use of the door in the event the operator mechanism fails.
   3. Second Chance Feature: When an obstruction or resistance to the opening swing is encountered the operator will pause at that point, and then attempt to continue opening the door. If the obstruction or resistance remains, the operator will again pause the door.
   4. Easily accessible main power and maintain hold-open switches will be provided on the operator.
   5. An electronically controlled clutch to provide adjustable opening force.
   6. A microprocessor to control all motor and clutch functions.
   7. An on-board power supply capable of delivering both 12VDC and 24VDC outputs up to a maximum of 1.0 amps combined load.
   8. All input and outputs power wiring shall be protected by a resettable circuit breaker.
      a. Preferred: LCN 4640 Series
b. **Preferred Alternative**: Stanley D-4990

### 2.09 ADA POWER DOORS

A. **Actuator**:
   1. Hardwire low voltage with round stainless steel 4.5”.

B. **Vestibule**:
   1. Doors operate independent of one another.
   2. Dual Vestibule Push plates are expectable, like the BEA PBDGP Series.
   3. Card access attached to ADA power doors must work in conjunction with one another.

### 2.10 CATCARD ACCESS READERS

A. There is to be a minimum of one door to have Card Access, this door is for the uses of the Facilities Services afterhours access to buildings. This is to be located at the Service Entrance to the building. If no Service Entrance, then door most convenient for Facilities Services Personnel.

B. Provide electrified locking hardware.

C. Provide power supply for the locking hardware per locking hardware manufacture.

D. When in conjunction with ADA power Door, outside actuator will be de-active when locking hardware is in the lock position.

E. Owner will provide the reader and access control hardware.

F. Coordinate wire requirement with owner.

G. **All catcard access doors must be coordinated with Auxiliaries IT, Campus IT, and MSU Locksmiths.**

### 2.11 ELECTRICAL POWER TRANSFER (EPT):

A. When installing electrified locking hardware on new construction and major remodels, use EPT’s.

B. Two wires EPT: Are to be of 18 gauge wire, Up to 2 amps @ 24VDC, with a 16 amps Maximum Surge.

C. Ten wires EPT: Are to be of 24 gauge wires, Up to 1 amps @ 24VDC, with a 16 amps Maximum surge.
   1. **Preferred**: Von Duprin

### 2.12 EXIT DEVICES

A. Provide Rim type device.

B. Devices are to be non-handed.

C. Provide keyed lever trim.

D. Concealed or surface vertical rod devices are not acceptable.

E. Provide heavy duty ANSI grade 1 devices.

F. Non-electric devices must be able to be field-converted on-site to electric operation by simply adding a new base assembly.

G. Install according to manufactures instructions.
   1. **Preferred**: Von Duprin 99.
   2. **Preferred Alternative**: Precision Apex.

### 2.13 WIRING

A. All wiring must be continued color even when it goes through a junction.

### 2.14 WEATHERSTRIP AND GASKETING

A. General: Except as otherwise indicated, provide continuous weather stripping at each leaf of every exterior door. Provide type, sizes and profiles shown or scheduled. Provide non-corrosive fasteners as recommended by manufacturer for application indicated.
B. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips is easily replaceable and readily available from stocks maintained by the manufacturer.

C. Acceptable Manufacturer:
   1. Pemko
   2. National Guard Products
   3. Zero

2.15 THRESHOLD
A. General: Except as otherwise indicated provide standard aluminum threshold unit of type, size and profile as shown or detailed.
B. Provide welded custom thresholds where scheduled and noted in the hardware sets. Provide cover plate where scheduled.
C. Provide thresholds that are 1" wider than depth of frame.
D. Acceptable Manufacturers:
   1. National Guard Products
   2. Pemko
   3. Zero

2.16 DOOR SILENCERS
A. All hollow metal door frames shall have a grey resilient type silencers. Quantity (3) on single door and quantity of (2) on pairs of door.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.
B. Verify that electric power is available to power operated devices and of the correct characteristics.

3.02 INSTALLATION
A. Install hardware in accordance with manufacturer's instructions and applicable codes.
B. Use templates provided by hardware item manufacturer.
C. Mounting heights for hardware from finished floor to center line of hardware item.

3.03 ADJUSTING
A. Adjust work under provisions of Section 01 7000.
B. Adjust hardware for smooth operation.

3.04 SCHEDULE - ATTACHED

END OF SECTION
SECTION 087100 - DOOR HARDWARE

1.1 DOOR HARDWARE SCHEDULE

**MANUFACTURERS:**
(MK) McKinney MFG.
(SC) Schlage Lock Co.
(LOC) Locknetics
(VO) Von Duprin
(LCN) LCN Closers
(IV) Ivex
(TR) Trimco
(PE) Pemko MFG.
(ST) Stanley
(GJ) Glynn Johnson
(CR) CR Laurence

**HARDWARE GROUP #1 - PRIVACY**

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<th>QTY</th>
<th>DESCRIPTION</th>
<th>MANUFACTURER</th>
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<tbody>
<tr>
<td>3</td>
<td>Hinges (MK) TA2714 – 4.5X4.5</td>
<td>MK</td>
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<tr>
<td>1</td>
<td>Latchset (SC) ND40S – OME-619</td>
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<td>3</td>
<td>Silencers (TR) 1229A</td>
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<tr>
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<td>Wall Stop (TR) W1274CCS</td>
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**HARDWARE GROUP #2**

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<tr>
<td>3</td>
<td>Hinges (MK) TA2714-NRP-4.5X4.5</td>
<td>MK</td>
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<tr>
<td>1</td>
<td>Office Lockset (SC) ND50PD – OME – 619</td>
<td>SC</td>
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<tr>
<td>3</td>
<td>Silencers (TR) 1229A</td>
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<td>Wall Stop (TR) W1274CCS</td>
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**HARDWARE GROUP #3 – STOREROOMS UN-LOCKABLE**

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<td>Hinges (MK) TA2714-NRP-4.5X4.5</td>
<td>MK</td>
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<td>Classroom Lockset (SC) ND70PD – OME – 619</td>
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<td>3</td>
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**HARDWARE GROUP #4 – STOREROOMS UN-LOCKABLE W/ CLOSER**

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<td>Hinges (MK) TA2714-NRP-4.5X4.5</td>
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<td>1</td>
<td>Classroom Lockset (SC) ND70PD – OME – 619</td>
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</table>
1 EA  CLOSER (LCN) 4041 – CUSH-N-STOP  ALUM
3 EA  SILENCERS (TR) 1229A
1 EA  WALL STOP (TR) W1274CCS

### HARDWARE GROUP #5 – DOUBLE PASSAGE

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<tr>
<th>Quantity</th>
<th>Item Description</th>
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<tbody>
<tr>
<td>6 EA</td>
<td>HINGES (MK) TA2714-NRP-4.5X4.5 US15</td>
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<tr>
<td>2 EA</td>
<td>PUSH PLATES: 8” X 36”</td>
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<tr>
<td>2 EA</td>
<td>CLOSER (LCN) 4041 – CUSH-N-STOP ALUM</td>
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<tr>
<td>4 EA</td>
<td>KICK PLATES: 36”x 12” STAINLESS STEEL</td>
</tr>
<tr>
<td>6 EA</td>
<td>SILENCERS (TR) 1229A</td>
</tr>
<tr>
<td>2 EA</td>
<td>WALL STOP (TR) W1274CCS</td>
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### HARDWARE GROUP #6 – DOUBLE EXTERIOR

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<td>HINGES (MK) TA2714-NRP-4.5X4.5 US15</td>
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<tr>
<td>2 EA</td>
<td>PANIC DEVICES CONCEALED VERTICAL ROD, ANSI A156.3, GRADE 1 WITH LEVER TRIM AND DOGGING</td>
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<tr>
<td>2 EA</td>
<td>SWEEPS - PILE BRUSH TYPE</td>
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<tr>
<td>1 SET</td>
<td>GASKET X LF OPENING</td>
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<td>1 EA</td>
<td>THRESHOLD X WIDTH OF OPENING- 1/2” MAX HEIGHT</td>
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<tr>
<td>2 EA</td>
<td>CLOSER (LCN) 4041 – CUSH-N-STOP ALUM</td>
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<tr>
<td>4 EA</td>
<td>KICK PLATES: 36”x 12” STAINLESS STEEL</td>
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<td>SILENCERS (TR) 1229A</td>
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<tr>
<td>2 EA</td>
<td>FLOOR STOP (TR)</td>
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### HARDWARE GROUP #7 - RESTROOMS

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<td>HINGES (MK) TA2714 – NRP – 5X5 US15</td>
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<tr>
<td>1 EA</td>
<td>CLOSER (LCN) 4041 – CUSH-N-STOP ALUM</td>
</tr>
<tr>
<td>2 EA</td>
<td>PUSH/PULLS, IVES 8303, 4x16, 10” CENTERS US32D</td>
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<tr>
<td>2 EA</td>
<td>KICK PLATES 12”x 35”</td>
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<tr>
<td>3 EA</td>
<td>SILENCERS (TR) 1229A</td>
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### HARDWARE GROUP #8 – EXTERIOR EXIT

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<th>Item Description</th>
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<td>3 EA</td>
<td>HINGES (MK) TA2714 – 4.5X4.5 US15</td>
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<tr>
<td>1 EA</td>
<td>CLOSER (LCN) 1460-72 – CUSH-N-STOP ALUM</td>
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<tr>
<td>1 EA</td>
<td>PANIC DEVICES CONCEALED VERTICAL ROD, ANSI A156.3, GRADE 1 WITH LEVER TRIM AND DOGGING US32D</td>
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<tr>
<td>1 EA</td>
<td>SWEEPS - PILE BRUSH TYPE</td>
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<tr>
<td>1 SET</td>
<td>GASKET X LF OPENING</td>
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<tr>
<td>1 EA</td>
<td>THRESHOLD X WIDTH OF OPENING- 1/2” MAX HEIGHT</td>
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HARDWARE GROUP #9 - EXT ENTRY W/ PROX CARD

3 EA
HINGES (MK) TA2714 4.5X4.5 US15
1 EA
CLOSER (LCN) 1460-72 - CUSH-N-STOP ALUM
1 EA
LOCKSET (SC) ND53PD – OME-619 ANSI F109
1 EA
ELECT STRIKE (VO) 6212FSE-24VDC US15
1 EA
POWER SUPPLY (VO) PS873

COORDINATE INTERFACE OF ELECT STRIKE WITH PROX CARD READER SUPPLIED BY OWNER’S SECURITY CONSULTANT

HARDWARE GROUP #11 – INTERIOR EXIT

3 EA
HINGES (MK) TA2714 – 4.5X4.5 US15
1 EA
RIM PANIC DEVICES CONCEALED VERTICAL ROD, ANSI A156.3, GRADE 1 WITH LEVER TRIM AND DOGGING
1 EA
CLOSER (LCN) 4040XP ALUM
1 EA
WALL STOP (TR) W1274CCS

HARDWARE GROUP #12 – STOREROOM ALWAYS LOCKED W CLOSER

3 EA
HINGES (MK) TA2714-NRP-4.5X4.5 US15
1 EA
STOREROOM LOCKSET (SC) ND80PD – OME – 619 ANSI F86
1 EA
CLOSER (LCN) 4041 – CUSH-N-STOP ALUM
1 EA
SEAL (PE) S88D
1 EA
WALL STOP (TR) W1274CCS

HARDWARE GROUP #13 – DOUBLE MECHANICAL

6 EA
HINGES (MK) TA2714 – NRP – 4.5X4.5 US15
2 EA
CLOSER (LCN) 4041 – CUSH-N-STOP ALUM
1 EA
LOCKSET STORE ROOM LOCK(S) ND80PD- OME-619 ANSI F86
1 EA
SEAL (PE) S88D
1 SET
FLUSH BOLTS (GJ) FB6/FB6W T&B US15
   (Inactive Leaf)
1 SET
ASTRAGAL (PE) 18061CP

HARDWARE GROUP #14 – MEETING ROOM

4 EA
HINGES (MK) TA2714 – NRP – 4.5X4.5 US15
1 EA
CLOSER (LCN) 4041 – CUSH-N-STOP ALUM
2 EA
PULLS CR 54LPBS ANSI F86
1 EA
SEAL (PE) S88D
# HARDWARE GROUP #15 — ACCESS DOOR — NO EXT. HARDWARD

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<tr>
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<td>Deadbolt Schlage B600</td>
<td>ANSI F86</td>
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SECTION 08 8000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Glass.
B. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS
A. Section 07 9005 - Joint Sealers: Sealant and back-up material.
B. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.
C. Section 08 1433 - Stile and Rail Wood Doors: Glazed lites in doors.
D. Section 08 4313 - Aluminum-Framed Storefronts: Glazing furnished by storefront manufacturer.
E. Section 08 4426 - Structural Glass Curtain Walls: Glass furnished as part of wall assembly.

1.03 REFERENCE STANDARDS
J. GANA (GM) - GANA Glazing Manual; 2009.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
C. Samples: Submit two samples __ by __ inch in size of glass and plastic units, showing coloration and design.
D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
   1. For solar control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.
E. LEED SUBmital:
   1. Product Data for MRc 4.1 and MRc 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.
2. Submit VOC content documentation for all non-performed sealants and primers.

1.05 QUALITY ASSURANCE
A. Perform Work in accordance with GANA Glazing Manual and GANA Sealant Manual for glazing installation methods.
B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

1.07 WARRANTY
A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
B. Sealed Insulating Glass Units: Provide a five (5) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.
C. Laminated Glass: Provide a five (5) year warranty to include coverage for delamination, including replacement of failed units.

PART 2 PRODUCTS

2.01 FLAT GLASS MATERIALS
A. Manufacturers:
   2. Substitutions: Refer to Section 01 6000 - Product Requirements.
B. Clear Float Glass (Type FG): Clear, heat strengthened.
   1. Comply with ASTM C 1036, Type 1, Transparent Flat, Class 1 clear, Quality Q3 (glazing select).
   2. 1/4 inch minimum.
C. Safety Glass (Type SG): Clear, fully tempered with horizontal tempering.
   1. Laminated with 0.030 inch thick plastic interlayer; comply with ASTM C 1172.
   2. Comply with ASTM C 1036, Type 1, Transparent Flat, Class 1 clear, Quality Q3 (glazing select) and ASTM C 1048.
   3. Comply with 16 CFR 1201 test requirements for Category II.
   4. 1/4 inch minimum thickness.
D. Spandrel Glass (Type SPG): Heat strengthened, green tinted.
   1. Ceramic fused frit of green color on back surface.
   2. Comply with ASTM C 1048, Condition B, spandrel glass one surface coated type II, pattern flat, Class II tinted heat absorbing and light reducing, Quality q7 decorative.
   3. 1/4 inch minimum thickness.
   4. Submit samples of color for approval.

2.02 SEALED INSULATING GLASS UNITS
A. Manufacturers: PPG Solarban 70XL Low E (2) + Clear
   1. Insulated Glass Units (Type T.1): Double pane with glass to elastomer edge seal. PPG Solarban 70XL
   2. Outdoor Appearance: Clear color, low-reflective glass.
   3. Place Low E coating on No. 2 surface within unit.
   4. Durability: Certified by an independent testing agency to comply with ASTM E 2190.
   5. Purge interpane space with dry hermetic air.
   6. Total unit thickness of 1 inch minimum. 1/2 inch air space and two 1/4 inch lites.
   7. Transmittance:
      a. Ultra-Violate: 6%
      b. Visible Light: 64%
      c. Total Solar Energy: 25%
   8. Reflectance:
      a. Visible Light: 12%
b. Total Solar Energy: 52%

9. U-Value:
   a. Winter Night-time: 0.28.
   b. Summer Day-time: 0.26.

10. Shading Coefficient: 0.32.
11. Solar Heat Gain Coefficient: 0.27.

B. Manufacturers: PPG Solarban 60 Solexia

1. **Insulated Glass Units (Type T.2):** Double pane with glass to elastomer edge seal, PPG Solarban 60 Solexia.
2. Outdoor Appearance: Clear color, low-reflective glass.
3. Place Low E coating on No. 2 surface within unit.
4. Durability: Certified by an independent testing agency to comply with ASTM E 2190.
5. Purge interpane space with dry hermetic air.
6. Total unit thickness of 1 inch minimum. 1/2 inch air space and two 1/4 inch lites.
7. Transmittance:
   a. Ultra-Violet: 10%
   b. Visible Light: 61%
   c. Total Solar Energy: 25%
8. Reflectance:
   a. Visible Light: 9%
   b. Total Solar Energy: 10%.
9. U-Value:
   a. Winter Night-Time: 0.29.
   b. Summer Day-Time: 0.27.
10. Shading Coefficient: 0.37.
11. Solar Heat Gain Coefficient: 0.32.
12. Light to Solar Gain: 1.91.

### 2.03 GLAZING COMPOUNDS

A. Manufacturers:

5. Substitutions: Refer to Section 01 6000 - Product Requirements.

B. Polyurethane Sealant: Single component, chemical curing, non-staining, non-bleeding; ASTM C 920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 20 to 35; clear color.

C. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C 920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; clear color.

### 2.04 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.

C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled and release paper; black color.
D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot ASTM C864 Option I; ASTM C864 Option II; black color.

E. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant.

D. Install sealants in accordance with ASTM C1193 and GANA Sealant Manual.

E. Install sealants in accordance with manufacturer's instructions.

3.03 INSTALLATION - EXTERIOR WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

A. Cut glazing tape to length and set against permanent stops, 3/16 inch below sight line. Seal corners by butting tape and dabbing with butyl sealant.

B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.

C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.

E. Install removable stops, with spacer strips inserted between glazing and applied stops 1/4 inch below sight lines.

1. Place glazing tape on glazing pane of unit with tape flush with sight line.

F. Install removable stops, with spacer strips inserted between glazing and applied stops, 1/4 inch below sight line. Place glazing tape on glazing pane or unit with tape flush with sight line.

G. Fill gap between glazing and stop with silicone type sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch below sight line.

H. Apply cap bead of silicone type sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.04 INSTALLATION - INTERIOR WET/DRY METHOD (TAPE AND SEALANT)

A. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch above sight line.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.

D. Install removable stops, spacer shims inserted between glazing and applied stops at 24 inch intervals, 1/4 inch below sight line.

E. Fill gaps between pane and applied stop with silicone type sealant to depth equal to bite on glazing, to uniform and level line.

F. Trim protruding tape edge.

3.05 FIELD QUALITY CONTROL

A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
B. Monitor and report installation procedures and unacceptable conditions.

3.06 CLEANING
   A. Remove glazing materials from finish surfaces.
   B. Remove labels after Work is complete.
   C. Clean glass and adjacent surfaces.

3.07 PROTECTION
   A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

END OF SECTION
SECTION 08 8836.21
ELECTROCHROMIC TINTABLE GLASS - ALTERNATE BID

PART 1 GENERAL

1.01 ALTERNATE BID:
A. Alternate Bid will include all glazing in the following curtain wall and storefront frames:
   1. CW-1
   2. CW-4
   3. CW-5
   4. SF-1
   5. SF-12
   6. SF-i2

1.02 SECTION INCLUDES
A. SageGlass electrochromic (EC) tintable insulating glass units (IGUs) for dynamic light and heat control.

1.03 RELATED REQUIREMENTS
A. Section 08 4313 - Aluminum-Framed Storefronts: Supporting framework for EC tintable IGUs.
B. Section 08 4413 - Glazed Aluminum Curtain Walls: Supporting framework for EC tintable IGUs.
C. Section 26 0905 - Electrochromic Tintable Glass Controls - Sage: SageGlass EC tintable IGUs control system requirements.

1.04 ABBREVIATIONS AND ACRONYMS
A. EC - Electrochromic.
B. IGCC - Insulating Glass Certification Council.
C. IGCC/IGMA Certification Program.
D. IGMA - Insulating Glass Manufacturers Alliance.
E. IGU - Insulating Glass Unit.
F. LBNL (IGDB) - Lawrence Berkeley National Laboratory (The International Glazing Database).

1.05 DEFINITIONS
A. Bite: Width dimension that edge of glass product is engaged into glazing channel.
B. Busbar: Thin strip of metal applied to glass that conducts electricity, and used to apply voltage across the EC surface of the IGU.
C. Fenestration: Openings in building’s envelope including windows, doors, and skylights.
D. Frame Cable: Cable that runs through framing system and connects IGU pigtail to low voltage wiring on interior of building at either the Terminal Box or Control Panel.
E. Framing System: Basic rigid supporting structure of IGU.
F. Glazing Performance Characteristics and Criteria:
   1. Center of Glass Characteristics: Performance values that take only center portion of IGU into account and not framing members.
   2. Fenestration Performance: Performance based on total fenestration, including glass and framing members, with values that are validated and certified by NFRC.
   3. Clear: Inactive (Off) state, with highest visible light transmission.
   4. Tinted: Active (On) state, with lowest visible light transmission.
   5. Variable Tint: Intermediate levels of tint ranging from full tint to clear.
   6. Inboard Lite: Pane of IGU that faces interior of building.
   7. Outboard Lite: Pane of IGU that faces exterior of building.
G. Glazing System: Soft material used in framing system.
H. IGU Pigtail: Cable that extends from individual EC tintable IGUs.

I. IGU Surfaces: Based on two outboard laminated panes of glass, air space, and one inboard pane of glass.
   1. Surface 1: Outdoor surface of outboard laminated pane of glass.
   2. Surface 2: Indoor surface of outboard laminated pane of glass and facing laminating material.
   3. Surface 3: Outdoor surface of inboard laminated pane of glass and facing laminating material.
   4. Surface 4: Indoor surface of outboard laminated pane of glass and facing air space.
   5. Surface 5: Outdoor surface of inboard pane of glass and facing air space.

J. Laminated Glass (2-ply): Two sheets of monolithic glass bonded together with plastic interlayer by heat and pressure.

1.06 REFERENCE STANDARDS

M. GANA (GM) - GANA Glazing Manual; 2009.

1.07 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of SageGlass IGUs as required for project configuration with the following related building elements:

B. Preinstallation Meeting: Conduct preinstallation meeting or teleconference to review procedures, schedules, safety, and coordination with other elements of Project. Require attendance of Mosaic Architecture, GCCM, glazing contractor, framing manufacturer, SAGE Electrochromics, Inc. SageGlass representative, electrical contractor, and other parties related to Work of this Section.
1.08 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Submit manufacturer's product data sheets including installation instructions.
C. Shop Drawings: Submit the following for SageGlass IGUs overall system in accordance with project configuration indicated.
   1. Support Framing System: Submit shop drawings of framing system and accommodations for cables, components, cable routing, location of connectors, and exits from framing system.
D. Samples: Submit manufacturer's EC tintable IGU sample that provides the two end states, and no intermediate states.
E. Certificates: Certify that products of this section meet or exceed specified requirements in accordance with IGCC and IGMA.
   1. Submit certificate indicating that IGU that passed the testing requirement contains the EC system (coatings, bus bars, and wires, etc.) as indicated in this section.
F. Test Reports: Submit test report for IGU seal durability in accordance with ASTM E2190, and indicate that IGU contains the EC system (coatings, bus bars, and wires, etc.) as indicated in this section.
G. Manufacturer's Qualification Statement.
H. Installer Qualification Statement.
I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in MSU Facilities's name and registered with manufacturer.
J. Specimen Warranty.

1.09 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five (5) years of documented experience, and having similar products installed and operating in at least five (5) different commercial architectural projects for at least five (5) years.
B. Installer Qualifications: Company specializing in performing the work of this section, approved by manufacturer, and capable of preparing data for glazed framing systems based on testing and engineering analysis of standard EC units used in assemblies similar to this project.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's instruction for receiving, handling, storing, and protecting materials.
B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
C. Store materials in original packaging, protected from exposure to harmful environmental conditions including static electricity, and at temperature and humidity conditions recommended by manufacturer.
D. Exercise care to prevent edge damage to glass, wiring, and coatings on glass.

1.11 FIELD CONDITIONS

A. Ambient Conditions: Ensure that substrate surface and ambient air temperature are at least 40 degrees F and rising, and remain above that temperature for at least 24 hours after application of sealants.

1.12 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
B. Warrant SageGlass IGUs against defects in material or workmanship causing material obstruction of vision as a result of fogging or film formation of the internal glass as a result of
failure of the hermetic seal for a period of ten (10) years from the date of manufacture of the SageGlass IGUs from the manufacturer.

C. Warrant SageGlass EC glass against defects in material or workmanship, resulting in failure to tint, for a period of five (5) years from the date of manufacture of the EC glass from the manufacturer.

D. Warrant SageGlass laminated glass products against lamination defects, such as edge separation or delamination that materially obstruct vision through the glass for a period of five (5) years from the date of manufacture of the EC glass from the manufacturer.

E. Manufacturer shall not be held responsible for any punitive, indirect, incidental or consequential damages, including without limitation, the cost to remove non-conforming product or the installation of replacement products.

PART 2 PRODUCTS

2.01 MANUFACTURERS

   1. Address: 2 Sage Way, Faribault, MN 55021.
   2. Telephone: (877) 724-3321.
   3. Fax: (507) 333-0145.
   4. E-mail: commercialsales@sageglass.com or archsolutions@sageglass.com.

2.02 PERFORMANCE REQUIREMENTS

A. Framing and Other Glazing Systems: Comply with the following requirements for framing used for SageGlass IGUs, and other adjacent non-EC tintable IGUs that are not considered part of this Work.
   1. Refer to Section(s) 08 4313, 08 4413, and 08 6300 for additional framing system requirements.
   2. Framing and glazing system compatibility shall be approved by SageGlass IGU manufacturer.
   3. Comply with the following for framing and IGUs:
      a. Edge Clearance: 1/4 inch.
      b. Bite Clearance: 5/8 inch.
      c. Face Clearance: 3/16 inch.
      d. Accommodate controls wiring for SageGlass IGUs. Refer to Section 26 0905 for requirements.
      e. Provide glazing materials compatible with SageGlass IGUs.
   4. Glazing and framing systems shall withstand normal thermal movements, wind loads, and impact loads, without failure; this includes loss due to defective manufacture, fabrication, installation, deterioration of glazing materials, and other construction defects.
      a. Normal Thermal Movement: Resulting from ambient temperature range of 120 degrees F and resultant temperature range within glass and glass framing members of 180 degrees F.
      b. Deterioration of Laminated Glass: Development of defects that include edge separation or delamination that obstructs vision through glass.
   5. Provide holes in framing system to run pigtails and frame cables, sized per manufacturer's requirements, with grommets to protect cables from damage.

B. Sizes and shapes of EC tintable IGU to comply with glazing manufacturer's guideline requirements and limitations as indicated.

C. Provide specified glass products in thicknesses and strengths as required to meet or exceed the criteria based on project loads and in-service conditions in accordance with ASTM E1300.
   1. Probability of failure not to exceed the following:
      a. 8 breaks per 1,000 for glass installed vertically or not over 15 degrees from vertical plane and under wind action.
      b. 1 break per 1,000 for glass installed 15 degrees or more from vertical plane and under action of wind, snow or both.
2.03 GLASS MATERIALS

A. Insulating Glass Units: Types as indicated; in compliance with ASTM E2188 and ASTM E2189 requirements.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190, IGMA TB-1201, and IGMA TM-4000.
   2. EC Glass Coating: Comply with requirements in accordance with ASTM C1376 and ASTM E2141.
   3. Low-E Coated Glass: Comply with quality requirements for cut size of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   4. Sealed Cavity Spacer: Austenitic stainless steel; four legs filled with 3A molecular sieve and silica gel desiccant and sealed; spacer color - black; nominal width 0.45 inch.
      a. Cavity Width: 1/2 inch.
      b. Provide hermetically sealed IGU with dehydrated airspace, with polyisobutylene primary seal and secondary two part silicone edge seal; color black.

B. Perimeter Obscuration Band: Black color, less than 13/16 inch from edge of IGU, and applied to Surface 2.

C. Busbar: Provide along edge of glass in accordance with SageGlass IGU performance requirements indicated.
   1. For IGUs with one dimension of 60 inch or less, provide busbars along each longer edge of the glass pane applied to Surface 4.
   2. For IGUs with shorter dimension greater than 60 inch, provide busbar along each longer edge, and 1/8 inch wide conductor at centerline of glass pane applied to Surface 4.

D. Pigtails: Multi-conductor sheathed cable extending from edge of SageGlass IGU and terminated with weatherproof connector for connection to frame cable within glazing pocket.
   1. Pigtail Length: 6 inch, minimum.

2.04 ELECTROCHROMIC TINTABLE INSULATING GLASS UNITS

A. SageGlass IGU: Maximum size of 60 inch by 120 inch.
   1. Applications: As indicated on the drawings.
   2. Laminated Outboard Lite:
      a. Outer Ply, Glass Type: Surfaces No. 1 and 2, Kind FT - Fully Tempered float glass.
         1) Thickness: 0.16 inch, nominal.
         2) Glass Color: Class 1 - Clear.
         3) Transparent optical coating (SR2.0) applied to Surface No. 2.
      b. Inner Ply, Glass Type: Surfaces No. 3 and 4, Annealed float glass.
         1) Thickness: 0.087 inch.
         2) Glass Color: Class 1 - Clear.
         3) SageGlass EC coating applied to Surface No. 4.
   3. Inboard Lite:
      a. Glass Type: Surfaces No. 7 and 8, Kind FT - Fully Tempered float glass.
         1) Thickness: 1/4 inch.
         2) Glass Color: Class 1 - Clear.
   4. Overall Thickness of Double Glazed IGU: 1 inch.

B. SageGlass IGU Characteristics:
   1. Cavity space filled with air, 100 percent.
   2. Clear State, Characteristics (Center of Glass): Cavity space filled with air, 100 percent.
      a. Visible Light Transmittance (VLT): 60 percent.
      b. Visible Light Reflectance, Inside: No greater than 15 percent.
      c. Visible Light Reflectance, Outside: No greater than 16 percent.
      d. Thermal Transmittance (U-Value Summer): 0.32.
      e. Thermal Transmittance (U-Value Winter): 0.32.
f. Solar Heat Gain Coefficient (SHGC): 0.42.
g. Shading Coefficient: 0.48.

3. Fully Tinted State, Characteristics (Center of Glass):
b. Visible Light Reflectance, Inside: No greater than 10 percent.
c. Visible Light Reflectance, Outside: 11 percent.
d. Thermal Transmittance (U-Value Summer): 0.32.
e. Thermal Transmittance (U-Value Winter): 0.32.
f. Solar Heat Gain Coefficient (SHGC): 0.10.
g. Shading Coefficient: 0.12.

4. Thermal and optical properties of manufacturer’s EC tintable IGU shall comply with requirements of NFRC and IGDB criteria.

5. Exterior reflected color, in compliance with the L*a*b* color space system, shall have a negative value of b* (blue) and not be positive (yellow) according to LBNL - WINDOW 6.3 calculations using appropriate NFRC approved LBNL (IGDB) data files.

C. Individual Pane Zoning of EC Tintable IGUs: Refer to drawings for specific locations, layout and required number of individual pane zones in each EC tintable IGU.

2.05 CONTROLS
A. System Control Requirements:
1. Provide system capable of providing up to 3 independently tintable zones in each pane to provide adequate light quality in the space.

2.06 ACCESSORIES
A. Glazing Materials: Compatible with EC tintable IGU components.
B. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864, Option I.
   1. Size: Length of 0.1 inch for each square foot of glazing or at least 4 inch long by width of glazing pocket space less 1/16 inch wide by height to suit glazing method, IGU pane weight and area.
C. Edge Spacer Shims/Blocks: Silicone, with 50 to 60 Shore A durometer hardness; ASTM C864, Option I.
   1. Size: At least 3 inch long by one half the depth of the glazing stop by thickness to suit application, self adhesive on one face.

PART 3 EXECUTION
3.01 VERIFICATION OF CONDITIONS
A. Verify that site conditions are acceptable for installation of EC tintable IGU system components.
B. Verify openings for installation of EC tintable IGUs are correctly sized and within acceptable tolerances.
C. Verify that framing weep system is operating properly and in accordance with GANA (GM) recommendations.
D. Verify that required minimum face and edge clearances are being maintained.
E. Verify that glazing channels, weeps and recesses are clear and free of obstructions and ready for glazing.
F. Verify that glazing pocket is dry where EC tintable IGUs pigtail and frame cable connection are required to be made.
G. Verify that framing system is sized appropriately for EC tintable IGUs thickness and proper precautions are taken to not over compress the edge seals upon installation.
H. Verify that EC tintable IGUs secondary seal is compatible with glazing sealants.
I. Verify frame channel dimensions are adequate for required cable runs to be made.
3.02 INSTALLATION

A. Install system components in accordance with SAGE Electrochromics, Inc. recommendations for IGU, sealants, gaskets and other glazing materials, pigtails, and frame cables and in compliance with more stringent requirements as indicated in GANA (GM).

B. Comply with framing manufacturer's and referenced industry recommendations regarding installation of expansion joints and anchors, accommodation of thermal movement, glass openings, use of setting blocks and spacer shims, and weep system layout.

C. Install EC tintable IGUs in prepared glazing channels and framing members in compliance with glass manufacturer's labels and glass orientation as indicated.

D. Active tintable areas of IGU shall extend from edge to edge of finished window system opening without visible light transmittance at full perimeter of IGU.

E. Protect IGU pigtails, frame and sensor cables from any damage during installation.
   1. Use grommets during installation to protect pigtails and cables routed through framing.
   2. When frame cable or connector is damaged during installation, replace in accordance with EC tintable IGU manufacturer's approved method.
   3. When IGU pigtails connector is damaged during installation, notify EC tintable IGU manufacturer for repair or replacement of damaged components using manufacturer's approved method.

F. Install cabling so that it will not be exposed to direct sunlight, even through glass. If installation in an exposed location is necessary, cover or paint cable using a latex water based paint in accordance with manufacturer's approved method.

G. Install setting blocks in glazing pocket as recommended by referenced glazing standards in the GANA (GM), IGMA and the EC tintable IGU manufacturer’s glazing guidelines.

H. Install edge spacer shims at each side glazing pocket to prevent IGU's from moving horizontally upon installation.

I. Provide bite on glass, minimum edge and face clearances, and glazing material tolerances as indicated in GANA (GM) and as approved by manufacturer.

J. Provide fully functional weep system throughout IGU framing system as indicated in GANA (GM).

K. Distribute weight of IGU along entire bottom edge rather than only at corners.

L. Install IGU's in accordance with IGMA TM-3000, and as follows:
   1. For dry glazed systems, provide an adequate seal consisting of at least 4 lbs per inch and not exceeding 10 lbs per inch pressure applied to the edges of IGU's by gaskets or other acceptable glazing materials.

3.03 CLEANING

A. Clean IGU inside and outside surfaces immediately after installation and curing of sealants in accordance with EC glass manufacturer’s requirements.
   1. Remove labels and markings from glass.

3.04 PROTECTION

A. IGU Argon Analyzer Testing: Do not allow the use of high voltage spark type inert gas analyzers on EC tintable IGUs as this may damage the film and controls, and potentially void the warranty.

B. Protect glass from edge damage during handling and installation.

C. Protect glass from coming into contact with contaminating construction related substances such as weld spatter, fireproofing, plaster, and concrete or mortar slurry.

D. Remove damaged glass that is broken, chipped, cracked, or damaged in any way, and replace with new materials.
1. Damaged Glass: Glass with edge damage or other imperfections that when installed could weaken the glass and impair performance and/or appearance.

END OF SECTION
SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Metal stud wall framing.
   B. Fire rated area separation walls.
   C. Metal channel ceiling framing.
   D. Acoustic insulation.
   E. Gypsum sheathing.
   F. Gypsum wallboard.
   G. Joint treatment and accessories.
   H. Textured finish system.
   I. Water-resistive barrier over exterior wall sheathing.

1.02 RELATED REQUIREMENTS
   A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
   B. Section 05 4000 - Cold-Formed Metal Framing: Exterior wind-load-bearing metal stud framing.
   C. Section 06 1000 - Rough Carpentry: Building framing and sheathing.
   D. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.
   E. Section 07 2100 - Thermal Insulation: Acoustic insulation.
   F. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.
   G. Section 07 9005 - Joint Sealers: Acoustic sealant.
   H. Section 09 2216 - Non-Structural Metal Framing.

1.03 REFERENCE STANDARDS
   A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2012.
   B. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2001 with 2004 supplement. (replaced SG-971)
   C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
   J. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2015.
   K. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2014.
1.04 SYSTEM DESCRIPTION

A. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.
C. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.
D. Product Data: Provide manufacturer’s data on partition head to structure connectors, showing compliance with requirements.
E. Test Reports: For stud framing products that do not comply with ASTM C645 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.
F. LEED Submittals:
   1. Product Data for MRc 4.1 and MRc 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.
   2. MR Credit 5: Local and Regional Materials: Product Data for Credit MR 5.1 and Credit MR 5.2. Submit data, including location and distance from project of material manufacturer and point of extraction, harvest or recovery for main raw material.

1.06 QUALITY ASSURANCE

A. Perform in accordance with ASTM C 840. Comply with requirements of GA-600 for fire rated assemblies.
   1. Maintain one copy of all installation standards at project site.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Environmental Conditions: Establish and maintain environmental conditions for application and finishing gypsum board to comply with ASTM C 840 and with gypsum board manufacturer’s recommendations.
B. Minimum Room temperature: For non-adhesive attachment of gypsum board to framing, maintain not less than 40 degrees F, For adhesive attachment and finishing of gypsum board maintain not less than 50 degrees F, for 48 hours prior to application and continuously thereafter until drying is complete.
C. Ventilate building space to remove water not required for drying joint treatment materials. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.
PART 2 PRODUCTS

2.01 GYPSUM BOARD MATERIALS

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Manufacturers:
   4. USG:www.usg.com
   5. Substitutions: See Section 01 6000 - Product Requirements.

C. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
   1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

D. Fire Resistant Type: Complying with Type X Requirements; UL or WH rated.
   1. Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X.
   2. Thickness: 5/8 inch.

E. Ceiling Board: Special sag-resistant type.
   1. Application: Ceilings unless otherwise indicated.
   2. Thickness: 5/8 inch.

F. Water-Resistant Gypsum Backing Board: ASTM C 1396/C 1396M; ends square cut.
   1. Application: Ceilings in bathrooms.
   2. Core Type: Regular and Type X, as indicated.

G. Gypsum Backing Board for Multi-Layer Application: ASTM C 442/ASTM C 1396 or where backing board is not available from manufacturer, gypsum wallboard, ASTM C 1396, of type edge configuration and thickness indicated below, in maximum lengths available to minimize end-to-end joints.

H. Glass-Mat Gypsum Sheathing Board: ASTM C 1396/C 1396M, moisture resistant type; sizes to minimize joints in place; fiberglass mat laminated to both sides and with manufacturer's standard edges; ends square cut.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Georgia-Pacific Gypsum; "DensGlass Sheathing" or comparable product by one of the following:
      a. CertainTeed Corp.
      b. National Gypsum Company
      c. USG Corporation
   2. Application: Exterior sheathing, unless otherwise indicated.
      a. Core Type: Regular and Type X, as indicated.
      b. Thickness: 1/2 inch.
      c. Edges: Square, for vertical application.

2.02 ACCESSORIES

A. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

B. Acoustic Insulation: As specified in Section 09 8311.

C. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.

D. Water-Resistive Barrier: No. 15 asphalt felt.
E. Joint Materials: ASTM C475 and as recommended by gypsum board manufacturer for project conditions.
   1. Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
F. High Build Drywall Surfacers: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
G. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.
H. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion resistant.
I. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION
   A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
   B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
      1. Laterally brace entire suspension system.
   C. Studs: Space studs at 16 inches on center.
      1. Extend partition framing to structure where indicated and to ceiling in other locations.
      2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
      3. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
   D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
   E. Standard Wall Furring: Install at concrete walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.
      1. Orientation: Horizontal.
      2. Spacing: As indicated.
   F. Blocking: Install wood blocking for support of:
      1. Framed openings.
      2. Wall mounted cabinets.
      3. Plumbing fixtures.
      4. Toilet partitions.
      5. Toilet accessories.
      6. Wall mounted door hardware.

3.03 ACOUSTIC ACCESSORIES INSTALLATION
   A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
   B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
      1. Place one bead continuously on substrate before installation of perimeter framing members.
      2. Place continuous bead at perimeter of each layer of gypsum board.
3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.04 GYPSUM BOARD INSTALLATION

A. Comply with ASTM C 840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Double-Layer Non-Rated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Use glass mat faced gypsum board at exterior walls and at other locations as indicated. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

D. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

E. Exterior Sheathing: Comply with ASTM C1280. Install sheathing with edges butted tight and ends occurring over firm bearing.
   1. Paper-Faced Sheathing: Immediately after installation, protect from weather by application of water-resistive barrier.

F. Exterior Soffits: Install exterior soffit board perpendicular to framing, with staggered end joints over framing members or other solid backing.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.06 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   2. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
   3. Level 3: Walls to receive textured wall finish.
   4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   5. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.
   2. Taping, filling and sanding is not required at base layer of double layer applications.

C. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.07 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION
SECTION 09 9000
PAINTING AND COATING

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Surface preparation.
B. Interior paint and coatings systems (LEED-09 NC Compliant) including surface preparation.
C. Field application of paints, stains, varnishes, and other coatings.

1.02 RELATED REQUIREMENTS
A. Section 01 3515 - LEED Certification Procedures: LEED rating system definition.
B. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 REFERENCE STANDARDS
B. SSPC (PM1) - Good Painting Practice: SSPC Painting Manual, Vol. 1; Society for Protective Coatings; Fourth Edition.
C. Materials Safety Data Sheets/Environmental Data Sheets: Per manufacturer's MSDS/EDS for specific VOCs (calculated per 40 CFR 59.406). VOCs may vary by base and sheen.
D. South Coast Air Quality Management District (SCAQMD): Rule 1113 - Architectural Coatings.
E. Green Seal inc.:
   2. GC-03 - Environmental Criteria for Anti-Corrosive Paints.

1.04 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide complete list of all products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.
   5. If proposal of substitutions is allowed under submittal procedures, explanation of all substitutions proposed.
C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, submit each color in each sheen available.
   3. Allow 15 days for approval process, after receipt of complete samples by Mosaic Architecture.
   4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.
D. LEED Report: VOC content of all interior opaque coatings actually used.
E. Manufacturer's Instructions: Indicate special surface preparation procedures.
F. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.
1.05 QUALITY ASSURANCE
A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years experience.
B. Material Safety Data Sheets: At project site maintain file of MSDS sheets for each product used; become familiar with and follow manufacturer's stated application and safety requirements.

1.06 MOCK-UP
A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.
B. Mock-up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish entire wall surface for each paint color specified for verification of products, colors and sheens.
   2. Mosaic Architecture will designate finish area walls.
   3. Do not proceed with remaining work until Mosaic Architecture approves the mock-ups.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS
A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
C. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
E. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
F. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

1.09 EXTRA MATERIALS
A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.
B. Furnish Owner with an additional one percent of each material and color, but not less than 1 gallon or 1 case, as appropriate.

PART 2 PRODUCTS
2.01 MANUFACTURERS
A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.
   1. Sherwin-Williams; www.sherwinwilliams.com
   2. Benjamin-Moore Company; www.benjaminmoore.com
   3. Substitutions: See Section 01 6000 - Product Requirements.
2.02 PAINTS AND COATINGS - GENERAL

A. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits of VOC content, exclusive of colorants added to tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop;
   1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
   2. Nonflat Paints, Coatings and Primers: VOC content of not more than 150 g/L.
   3. Anti-Corrosive and Anti-Rust Paints applied to Ferrous Metals: VOC not more than 250 g/L.
   4. Floor Coatings: VOC not more than 100 g/L.

B. Volatile Organic Compound (VOC) Content for Exterior Paints and Coatings:
   1. Provide coatings that comply with the most stringent requirements specified in the following:
      b. Ozone Transport Commission (OTC) Model Rule, Architectural, Industrial, and Maintenance Coatings: www.otcair.org; specifically:
         1) Opaque, Flat: 50g/L, maximum
         2) Opaque, Nonflat: 150g/L, maximum
         3) Opaque, High Gloss: 250g/L, maximum
         4) Varnishes: 350g/L, maximum

C. Chemical Content: The following compounds are prohibited:
   1. Aromatic Compounds: In excess of 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
   2. Acrolein, acrylonitrile, antimony, benzene, butyl benzyl phthalate, cadmium, di(2-ethylhexyl) phthalate, di-n-butyl phthalate, di-n-octyl phthalate, 1,2-dichlorobenzene, diethyl phthalate, ethylbenzene, formaldehyde, hexavalent chromium, isophorone, lead, mercury, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride, naphthalene, toluene (methylbenzene), 1,1,1-trichloroethane, vinyl chloride.

   1. Provide ready mixed paints and coatings, except field-catalyzed coatings.
   2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

2.03 PAINT SYSTEM

A. Provide Premium Grade systems (2 top coats) as defined in MPI Architectural Painting Specification Manual, except as otherwise indicated.

B. Where a specified paint system does not have a Premium Grade, provide Custom Grade system.

C. Where sheen is not specified or more than one sheen is specified, sheen will be selected later by Mosaic Architecture from the manufacturer's full line.

D. Provide colors as scheduled on Drawings.

2.04 EXTERIOR PAINT SYSTEM

A. Brick Units and precast sills:

B. Ferrous Metals; Primed, Gloss Acrylic, 2 Coat:
   1. Pro Industrial Pro-Cryl - Universal Acrylic Primer, B66-310 series.
2.05 INTERIOR PAINT

A. Brick Units:

B. Exposed steel substrates including structural steel, sprinkler piping and exposed ductwork:
   1. 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, (5.0 mils wet, 2.0 mils dry).
   3. 3rd Coat: S-W ProClassic Waterbased Acrylic Semi-Gloss, B31 Series, (4.0 mils wet, 1.3 mils dry per coat).

C. Gypsum Board:
   1. Applications include but are not limited to walls, ceilings, soffits, and bulkheads.
      a. Semi-Gloss: All restrooms and mop closets to recieve Semi-gloss finish.
         1) 1st Coat: S-W Harmony Interior Latex Primer, B11 (4.0 mils wet, 1.3 mils dry)
         3) 3rd Coat: S-W Harmony Interior Latex Semi-Gloss, B10 Series (4.0 mils wet, 1.6 mils dry per coat).
      b. Eggshell: All other rooms.
         1) 1st Coat: S-W Harmony Interior Latex Primer, B11 (4.0 mils wet, 1.3 mils dry).
         2) 2nd Coat: S-W Harmony Interior Latex Egg-Shel, B9 Series.
         3) 3rd Coat: S-W Harmony Interior Latex Egg-Shel, B9 Series (4.0 mils wet, 1.7 mils dry per coat).

D. Waterproofing Concrete Slab Sealer
   3. H&C Concrete Sealer Wet Look Water Based.

2.06 ACCESSORY MATERIALS

A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.

B. Patching Material: Latex Filler.

C. Fastener Head Cover Material: Latex Filler.

PART 3 EXECUTION

3.01 SCOPE - SURFACES TO BE FINISHED

A. Paint all exposed surfaces except where indicated not to be painted or to remain natural; the term "exposed" includes areas visible through permanent and built-in fixtures when they are in place.

B. Paint the surfaces indicated on the Drawings, and as follows:
   1. If a surface, material, or item is not specifically mentioned, paint in the same manner as similar surfaces, materials, or items, regardless of whether colors are indicated or not.
   2. Paint surfaces behind movable equipment and furnishings the same as similar exposed surfaces.
   3. Paint surfaces to be concealed behind permanently installed fixtures, equipment, and furnishings, using primer only, prior to installation of the permanent item.
   4. Paint back sides of access panels and removable and hinged covers to match exposed surfaces.
   5. Finish top, bottom, and side edges of exterior doors the same as exposed faces.
   6. Paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment occurring in finished areas to match background surfaces, unless otherwise indicated.

C. Do Not Paint or Finish the Following Items:
1. Items fully factory-finished unless specifically noted; factory-primed items are not considered factory-finished.
2. Items indicated to receive other finish.
3. Items indicated to remain naturally finished.
4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
5. Anodized aluminum.
6. Polished and brushed stainless steel items.
7. Concealed piping, ductwork, and conduit.

3.02 EXAMINATION
A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
C. Test shop-applied primer for compatibility with subsequent cover materials; report incompatible primer conditions and submit recommended changes for Mosaic Architecture's approval.
D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
   3. Concrete Floors and Traffic Surfaces: 8 percent.

3.03 PREPARATION
A. Prepare surfaces as specified in MPI Architectural Painting Specification Manual and as follows for the applicable surface and coating; if multiple preparation treatments are specified, use as many as necessary for best results; where the Manual references external standards for preparation (e.g. SSPC standards), prepare as specified in those standards; comply with coating manufacturer's specific preparation methods or treatments, if any.
B. Comply with manufacturer's written instructions and recommendation in MPI Architectural Painting Specifications Manual applicable to substrates indicated.
C. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size and weight of item, provide surface applied protection before surface preparation and painting.
   1. After completing painting operation, use workers skilled in the trades involved to reinstall items that were removed. Remove surface applied protection if any.
   2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
D. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease and incompatible paints and encapsulant.
E. Concrete Substrates: Remove release agents, curing compounds, efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
F. Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
G. Steel Substrates: Remove rust and loosemill scale. Clean using methods recommended in writing by paint manufacturer.
H. Galvanized Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical method to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
I. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.
J. Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.

K. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

L. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.04 APPLICATION

A. Apply products in accordance with manufacturer's instructions and as specified or recommended by MPI Manual, using the preparation, products, sheens, textures, and colors as indicated.

1. Remove, refinish, or repaint work not complying with requirements.

B. Do not apply finishes over dirt, rust, scale, grease, moisture, scuffed surfaces, or other conditions detrimental to formation of a durable coating film; do not apply finishes to surfaces that are not dry.

C. Use applicators and methods best suited for substrate and type of material being applied and according to manufacturer's instructions.

1. Brush Application: Use brushes best suited for the type of material applied; use brush of appropriate size for the surface or item being painted; produce results free of visible brush marks.

2. Roller Application: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.

3. Spray Application: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

4. Where application method is listed in the MPI Manual for the paint system that method is required; otherwise any application method recommended by manufacturer for material used and objects to be painted is acceptable.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate; provide total dry film thickness of entire system as recommended by manufacturer.

1. Number of coats and film thickness required are the same regardless of application method.

2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance.

3. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.

E. Apply finish to completely cover surfaces with uniform appearance without brush marks, runs, sags, laps, ropiness, holidays, spotting, cloudiness, or other surface imperfections.

1. Before applying finish coats, apply a prime coat of material recommended by manufacturer, unless the surface has been prime coated by others; where evidence of suction spots or unsealed areas in first coat appear, recoat primed and sealed surfaces to ensure finish coat with no burn through or other defects due to insufficient sealing.

2. Apply first coat to surface that has been cleaned, pretreated, or otherwise prepared as soon as practical after preparation and before subsequent surface deterioration.

3. Do not apply succeeding coats until the previous coat has cured as recommended by manufacturer.

4. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat will not cause the undercoat to lift or lose adhesion.

5. If manufacturer's instructions recommend sanding to produce a smooth, even surface, sand between coats.
6. Before applying next coat vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

7. Pigmented (Opaque) Finishes: Provide smooth, opaque surface of uniform finish, color, appearance, and coverage.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent surfaces.

C. Protect work of other trades against damage from paint application. Correct damage work to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

END OF SECTION
SECTION 10 3100
MANUFACTURED FIREPLACES

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Manufactured steel box fireplace.
B. Insulated chimney flue and associated roof flashings.

1.02 RELATED REQUIREMENTS
A. Section 23 1123 - Facility Natural-Gas Piping: Gas piping to fire box.
B. Section 26 2717 - Equipment Wiring.

1.03 REFERENCE STANDARDS

1.04 SYSTEM DESCRIPTION
A. Built-in firebox with concealed flue; rectangular shape; gas starter and circulating fan.

1.05 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide fire box cabinet dimensions, clearances required from adjacent dissimilar construction, applicable regulatory agency approvals, electrical characteristics of fan.
C. Shop Drawings: Indicate fire box rough opening dimensions, rough opening sizes for chimney flue, and fan size.
D. Manufacturer's Certificate: Certify that fireplace components meet or exceed UL (DIR) requirements.
E. Manufacturer's Instructions: Indicate installation procedures and component installation sequence, clearances and tolerances from adjacent construction, and _____.

1.06 REGULATORY REQUIREMENTS
A. Conform to applicable code for clearances from adjacent materials, chimney height above roof line requirements, and unit UL approval.
B. Listed by Underwriters Laboratories Inc. (UL) as complying with UL 127.
C. Products Requiring Electrical Connection: Listed and labeled by UL (DIR) or testing firm acceptable to authorities having jurisdiction, as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Manufactured Fireplaces:
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COMPONENTS
A. Pier-36TR Multi-Sided Gas Fireplace
   1. Controls: Smart-Stat
   2. Front: 36" Pier TR and TRB
   3. Front Width: 40-1/2 inches
   4. Height: 38 inches.
   5. Depth: 24 inches.
   7. BTU/Hour Input: 37,000.
PART 3  EXECUTION

3.01  VERIFICATION OF CONDITIONS
   A.  Verify that prepared openings are ready to receive work and opening dimensions are as indicated on drawings.
   B.  Verify that proper power supply and fuel source are available.

3.02  INSTALLATION
   A.  Install unit assembly in accordance with manufacturer's instructions and UL requirements.
   B.  Install chimney plumb through prepared openings using fire stop spacers.
   C.  Secure chimney in opening framing with appropriate fasteners.
   D.  Install roof flashings to ensure moisture is shed from chimney flue.

3.03  TOLERANCES
   A.  Maximum Variation of Chimney From Plumb: 1/2 inch.

END OF SECTION
SECTION 11 1313
LOADING DOCK BUMPERS

PART 1 GENERAL
1.01 SECTION INCLUDES
   A. Dock bumpers of reinforced rubber with attachment frame.

1.02 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Indicate unit dimensions, method of anchorage, and details of construction.
   C. Manufacturer's Installation Instructions: Indicate special installation requirements.

PART 2 PRODUCTS
2.01 MANUFACTURERS
   A. Dock Bumpers:
      4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COMPONENTS
   A. Bumpers: Molded rubber, ozone resistant, nylon reinforced, minimum Shore A Durometer of 70, tensile strength of 950 to 1050 psi:
      1. Thickness From Wall: 3 inches.
      2. Vertical Height: 10 inches.
      3. Width: 5 inches.
      4. Profile: Rectangular.
   B. Attachment Hardware: 3/4 inch diameter galvanized bolts and expansion shields.

PART 3 EXECUTION
3.01 INSTALLATION
   A. Install dock bumpers in accordance with manufacturer's instructions.
   B. Set plumb and level.
   C. Secure angle end frames to concrete.

END OF SECTION
SECTION 11 1319.13
LOADING DOCK LEVELERS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Prefabricated steel leveler with guard rails.

1.02 RELATED REQUIREMENTS
A. Section 11 1313 - Loading Dock Bumpers.

1.03 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide materials and finish, installation details, roughing-in measurements, and operation of unit and safety lock device.
C. Shop Drawings: Indicate required opening dimensions, tolerances of opening dimensions, placement dimensions of safety lock device, perimeter conditions of construction.
D. Manufacturer's Installation Instructions: Indicate special requirements.
E. Operation Data: Provide operating instructions, identify unit limitations.
F. Maintenance Data: Provide unit maintenance information, lubrication cycles, spare parts manual.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Dock Levelers:
   1. Basis of Design: Acceptable Manufacturer: Nova Technology, which is located at: N90 W14507 Commerce Dr.; Menomonee Falls, WI 53051; Toll Free Tel: 800-236-7325; Tel: 262-502-1591; Fax: 262-502-1511; Email:request info (sales@novalocks.com); Web:www.novalocks.com
   2. Other Acceptable Manufacturers:
      d. Substitutions: See Section 01 6000 - Product Requirements.

2.02 COMPONENTS
A. Dock Leveler:
   2. Deck Width: 6'-0" inch.
   3. Deck Length: 8'-0" inch.
   4. Operating Range: 12 inches above dock level, 12 inches below dock level.
   5. Capacity: 25,000 lbs.
   7. Weather Seals: Brush

B. Vehicle Restraint: Mechanical lock, fabricated and welded steel plate construction, spring loaded to automatically latch when activated, to conform to ICC semitrailer vehicle bumper requirements for dimension and placement.

C. Structural: The platform is constructed of 1/4 inch thick four-way high tensile 50,000 minimum yield A572 safety tread plate. Platform is reinforced and supported by full length 6 inches (152 mm) high formed C channels welded to deck and front and rear header for firm structural support. Front and rear header plates are 1/2 inch thick by 7-inches (13 mm by 178 mm) high hot rolled steel. NOVA NHS series lips are four-way safety tread plate, the 25,000 pounds (11,339 Kg) Comparative Industry Rating (CIR) capacity is 1/2 inch (13 mm) thick. Hinge tubes are 1-3/4 inches (44 mm) OD by 5/16 inch (8 mm) wall, 1-7/8 inches (48 mm) OD by 3/8 inch
(9.5 mm) wall or 2-1/8 inches (54 mm) OD by 1/2 inch (13 mm) wall depending on CIR. All lip hinge pins are 1 inch (25 mm) diameter M1044 steel. Steel header gussets are standard on all models 35,000 pounds CIR and above. All units have grease fittings as standard. All platforms are designed to compensate for up to 4 inches (102 mm) of canted trailer bed.

D. Operation: Push-button depressed and held activating the hydraulic system that lifts the deck from a stored position. When the deck reaches the fully elevated position, the lip cylinder is activated extending the lip assembly. Release push-button when the lip is fully extended and the deck descends to the trailer bed. Lip will rest on the trailer bed and the deck will float with the trailer (12 inches (305 mm) above/below dock operating range). If a trailer departs prior to storing the leveler the velocity fuse will limit the movement of the deck within 1 inch (25 mm) to 3 inches (76 mm). After loading/unloading is complete, the attendant depresses the push-button lifting the leveler from the trailer bed. The push-button is held until the lip falls pendant and then released allowing the leveler to rest in the lip keepers.

E. Electrical: The hydraulic power unit motor is a 1.25 HP TENV at 120V or 208V single-phase or 208V, 230V, 460V, or 575V three-phase. The electrical control panel is NEMA 12 enclosure. All electrical components, connections and wiring are UL listed or recognized.

F. Hydraulics: The platform is raised by a main hydraulic cylinder; all hydraulic hoses are routed under the leveler platform, away from debris. The ramp cylinder is a hard chrome-plated double acting design with a 3-inch (76 mm) bore and is equipped with a velocity safety stop to limit free fall of a loaded platform to 3 inches (76 mm). Motor pump is mounted up for easy access and to clear debris in pit and includes a translucent reservoir for monitoring fluid level.

G. Recommended Safety Equipment: NOVA vehicle restraint systems help prevent unexpected trailer departure from the loading dock and minimize trailer creep during the loading/unloading process.

H. Warranty: In addition to the Standard Product Warranty provided with all NOVA Products, NOVA Technology guarantees materials, components and workmanship to be free of defects.

I. Pit Frame: Steel angle, 3 x 3 x 1/4 inch; welded corners, fitted with anchors 2'-0" inch oc for concrete embedment.

2.03 ACCESSORIES
A. Dock Bumpers: Specified in Section 11 1313.

2.04 FINISHES
A. Leveler Platform: Hot dip galvanized to 1.25 oz/sq ft finish.
B. Leveler Frame: Hot dip galvanized to 1.25 oz/sq ft finish.
C. Railing: Hot dip galvanized to 1.25 oz/sq ft finish.
D. Pit Frame: Hot dip galvanized to 1.25 oz/sq ft finish.
E. Vehicle Restraint: Yellow painted hook, galvanized steel operating mechanism.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify that rough-in openings are acceptable.

3.02 INSTALLATION
A. Install dock leveler and mechanical safety vehicle lock unit in prepared opening in accordance with manufacturer's instructions.
B. Set square and level.

END OF SECTION
SECTION 12 9300
SITE FURNISHINGS

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Tables and Chairs.
   B. Skate deterrents.

1.02 SUBMITTALS
   A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
   B. Product Data: Provide manufacturer’s specifications and descriptive literature, installation instructions, and maintenance information.
   C. Shop Drawings: Indicate plans for each unit or groups of units, elevations with model number, overall dimensions; construction, and anchorage details.

1.03 WARRANTY
   A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
   B. Provide manufacturer's warranty against defects in materials or workmanship for ductile iron castings for a period of 10 years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS
   A. Tables and Chairs:
      2. Substitutions: See Section 01 6000 - Product Requirements.
   B. Skate Deterrents:
      2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 TABLES
   B. Product Representative: Vivian Kovacs, 800-430-6206 x1323
      1. Crena Table.
      2. Size:
         a. Height: 29".
         b. Diameter: 42".
            1) No umbrella hole.
      3. Table Top: Catena 16 gauge with rolled edge, reinforced steel channels beneath top
      4. Table Supports: 2.5" outer diameter x 0.120" wall steel tubing welded to 18" diameter cast iron base
      5. Mounting: Catena Free standing
      6. Finish: Powder Coat: Color to be determined
      7. Quantity: Per Drawings

2.03 CHAIRS
   B. Product Representative: Vivian Kovacs, 800-430-6206 x1323.
      1. Parc Vue Bench – custom size as Chair
      2. Size:
         a. Backed and arms.
         b. Depth: 25".
c. Overall Height: 35-1/2"
d. Arm Height: 27-1/4"
e. Width: 21"
3. Finish: Powder coated: Color to be determined
4. Mounting: Free standing with nylon 6-6-400 glides
5. Quantity: Per Drawings

2.04 SKATE DETERRENTS

A. Wall Skate Deterrents:
      a. Penn 135, install per manufacturer’s recommendations.
      c. Outside Dimensions: Approximately 6" long x 1" wide x 1" tall.
      d. Mounting: (2) blind SMART PIN PLUS anchors, with two part epoxy.
      e. Finish: Brushed Finish
      f. Quantity: Per Drawings

B. Handrail Skate Stops:
      a. HR Series PN #HR1.5, install per manufacturer’s recommendations
      b. Materials: Cast Aluminum
      c. Outside Dimensions: Approximately 2” long
      d. Mounting: (2) Stainless Steel tamper resistant screws, and two part epoxy
      e. Finish: Clear Anodize coating
      f. Quantity: Spaced 4’ o.c. maximum

END OF SECTION
SECTION 12 9313
BICYCLE RACKS

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Bicycle racks.

1.02 RELATED REQUIREMENTS
A. Section 03 3000 - Cast-in-Place Concrete: Mounting surface for bicycle racks.

1.03 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
C. Shop Drawings: Indicate size, shape, and dimensions, including clearances from adjacent walls, doors, and obstructions.
D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.
E. LEED Submittal:
   1. Product Data for Credit MR4.1 and Credit MR4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating costs for each product having recycled content.

1.04 DELIVERY, STORAGE, AND HANDLING
A. Store products in manufacturer's unopened packaging until ready for installation.
B. Handle racks with sufficient care to prevent scratches and other damage to the finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS
A. Outdoor Bicycle Racks:
   1. Peak Bike Racks; www.peakracks.com
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 BICYCLE RACKS
A. Single Sided:
   1. 5 bike capacity
   2. 6 bike capacity
   3. 7 bike capacity
   4. 8 bike capacity
B. Double Sided:
   1. 6 bike capacity
   2. 8 bike capacity
C. Mounting: Surface mount per manufacturer's recommendations.
D. Finish: Hot Dipped Galvanized.
E. Quantity: Per Drawings.

PART 3 EXECUTION

3.01 EXAMINATION
A. Examine surfaces to receive bicycle racks.
B. If substrate preparation is the responsibility of another installer, notify Mosaic Architecture of unsatisfactory preparation before proceeding.
C. Do not begin installation until unsatisfactory substrates have been properly repaired.

3.02 PREPARATION
A. Ensure surfaces to receive bicycle racks are clean, flat, and level.

3.03 INSTALLATION
A. Install in accordance with manufacturer's instructions.
B. Install bicycle racks level, plumb, square, and correctly located as indicated on the drawings.
C. In-Ground Anchor Installation:
   1. Prepare holes in size according to manufacturer’s instructions.
   2. Place anchoring bolts through the holes in the pipe.
   3. Lower rack into holes, ensuring the bottom of lower bends are at least 1-1/2 inch from the ground.
   4. Pour concrete and level rack.
   5. Support until dry.

3.04 CLEANING
A. Clean installed work to like-new condition. Do not use cleaning materials or methods that could damage finish.

3.05 PROTECTION
A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. The requirements listed in this section are supplemental to the Division 01 General Requirements.

B. It shall be the responsibility of the Plumbing and Mechanical Contractor to examine and refer to all Architectural, Civil, Structural, Electrical, and Landscape and specifications for construction conditions which may affect the scope of Plumbing and HVAC work. Inspect the building site and existing facilities for verification of present conditions. Make proper provisions for these conditions in performance of the work and cost thereof.

C. Plumbing and Mechanical work for this project shall include all items, articles, materials and the associated labor mentioned, schedules or shown in these specifications and in the accompanying drawings.

D. Furnish and install all equipment, materials and any required incidental items required by good practice to complete the systems described herein.

1.2 CODES AND STANDARDS

A. Work shall meet the requirements of the plans and specifications and shall not be less than the minimum requirements of applicable sections of the latest Codes and Standards of the following Organizations:

1. American Gas Association (AGA)
2. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
3. American Society of Mechanical Engineers (ASME)
4. Sheet Metal and Air Conditioning Contractors’ National Association Inc. (SMACNA)
5. American Water Works Association (AWWA)
6. National Electrical Code (NEC)
7. National Electrical Manufacturers Association (NEMA)
8. National Fire Protection Association (NFPA)
9. Uniform Plumbing Code (UPC)
10. Occupational Safety & Health Act (OSHA)
11. Plastic Pipe Institute (PPI)
12. International Mechanical Code (IMC)
15. Requirements of the Serving Utility Company
16. Local and State Codes and Ordinances
1.3 FEES AND PERMITS

A. The Plumbing and Mechanical Contractors shall pay all fees and arrange all permits required for work done under their contract and under their supervision by subcontract.

B. All usage contracts between the Owner and the serving utilities company, such as membership and usage charges or fees, etc., for the purpose of obtaining the services for the utility company shall be applied for and paid for by the Owner.

1.4 MATERIALS AND EQUIPMENT

A. Manufacturer’s trade names and catalog numbers listed are intended to indicate the quality of equipment or materials desired. Manufacturers not listed in the specification will be considered substitutions and must have prior approval.

B. See Division 01 for Substitutions Procedures. Requests for substitution are to be submitted sufficiently ahead of the deadline, to give ample time for examination. Prior approval request for substitution must indicate the specific item or items to be furnished in lieu of those scheduled, together with complete technical and comparative data on scheduled items and items proposed for substitution.

C. If the engineer approves any proposed substitution, the approved product will be listed in an addendum. Bidders shall not rely on approval made in any other manner.

D. Mechanical equipment may be installed with manufacturer’s standard finish and color except where specific color, finish or choice is indicated. If the manufacturer has no standard finish, equipment shall have a prime coat and two finish coats of gray enamel.

E. High altitude operation: Capacity of all equipment is to be sized and manufactured to perform at the elevation of the project site. If not specifically indicated in the equipment schedule or in the specifications provide all required accessories and equipment for proper operation at elevation of the project site.

F. This Contractor shall be responsible for materials and equipment installed under this contract. Contractor shall also be responsible for the protection of materials and equipment of others from damage as a result of his work.

G. Manufactured material and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by manufacturer unless herein specified to the contrary.

H. This Contractor shall make the required arrangement with General Contractor or Construction Manager for the introduction into the building of equipment too large to pass through finished openings.

I. Store materials and equipment indoors at the job site or, if this is not possible, store on raised platforms and protect from the weather by means of waterproof covers. Coverings shall permit circulation of air around the materials to prevent condensation of moisture. Screen or cap openings in equipment to prevent the entry of vermin.
1.5 INTENT OF DRAWINGS

A. The drawings are diagrammatic and do not necessarily show exact location of piping and ductwork unless specifically dimensioned. Riser and other diagrams are schematic and do not necessarily show the physical arrangement of the equipment. They shall not be used for obtaining lineal runs of piping or ductwork, nor shall they be used for shop drawings for piping and ductwork fabrication or ordering. Discrepancies shown on different plans, or between plans and actual field conditions shall be brought to the attention of the Architect/Engineer for resolution.

1.6 RESPONSIBILITY

A. Plumbing and HVAC work shall conform to requirements of all divisions 22 and 23 specifications.

B. The Plumbing and Mechanical Contractors shall be responsible for the installation of a satisfactory and complete system in accordance with the intent of the drawing and specifications. Provide, at no extra cost, all incidental items, materials, accessories and labor required for completion of the work even though they are not specifically mentioned or indicated on the drawings or in the specifications.

C. The drawings do not attempt to show complete details of the building construction which affect the mechanical and plumbing installation; and reference is therefore required to the Architectural, Civil, Structural, Landscape and Electrical drawings and specifications and to shop drawings of all trades for additional details which affect the installation of the work covered under this Division of the Contract.

D. Location of mechanical and plumbing system components shall be checked for conflicts with openings, structural members and components of other systems having fixed locations. In the event of any conflicts, the Architect/Engineer shall be consulted and their decision shall govern. Necessary changes shall be made at the Contractor's expense.

E. Determine, and be responsible for, the proper location and character of inserts for hangers, chases, sleeves, and other openings in the construction required for the work, and obtain this information well in advance of the construction progress so work will not be delayed.

F. Final location of inserts, hangers, etc., required for each installation, must be coordinated with facilities required for other installations to prevent interference.

G. Take extreme caution not to install work that connects to equipment until such time as complete Shop Drawings of such equipment have been approved by the Architect/Engineer. Any work installed by the Contractor, prior to approval of Shop Drawings, will be at the Contractor's risk.

H. All modifications and changes required due to installation of substituted equipment shall be made at the contractor's expense.
I. It shall be the responsibility of the installing contractor to coordinate changes to work by other trades that result from the installation of equipment other than the scheduled equipment.

J. If the provided equipment is heavier or larger than the scheduled or specified equipment, it shall be the responsibility of the installing contractor to coordinate the required structural changes and pay for any and all associated cost.

K. If the provided equipment has different motor characteristics or electrical requirements than the scheduled or specified equipment, it shall be the responsibility of the installing contractor to coordinate the required changes and pay for any and all associated cost.

L. If larger or additional electrical conduits are required due to the installation of equipment other than the scheduled or specified equipment it shall be the responsibility of the installing contractor to coordinate the required changes and pay for any and all associated cost.

M. If the provided equipment requires different fluid flow rates than the scheduled or specified equipment, it shall be the responsibility of the installing contractor to coordinate all required changes including but not limited to pumps, piping, valves, etc and pay for any and all associated cost.

N. At all times during the performance of this Contract, properly protect work from damage and protect the Owner's property from injury of loss. Make good any damage, injury or loss, except such as may be directly due to errors in the Bidding Documents or caused by Agents or Employees of the Owner. Adequately protect adjacent property as provided by law and the Bidding Documents. Provide and maintain passageways, guard fences, lights and other facilities for protection required by Public Authority or Local conditions.

O. The Contractor shall be responsible for damages due to the work of their contractors, to the building or its contents, people, etc.

1.7 REVIEW

A. All work and material is subject to review at any time by the Architect/Engineer or his representative. If the Architect/Engineer or his representative finds material that does not conform to these specifications or that is not properly installed or finished, correct the deficiencies in a manner satisfactory to the Architect/Engineer at the Contractor's expense.

1.8 WORKMANSHIP

A. Work under this contract shall be performed by workmen skilled in the particular trade, including work necessary to properly complete the installation in a workmanlike manner to present a neat and finished appearance.

B. Obtain Architect's/Engineer's approval before performing any cutting on structural members or patching of building surfaces. Any damage to the building or equipment by
the Mechanical or Plumbing Contractor shall be the responsibility of the Mechanical or Plumbing Contractor and shall be repaired by skilled craftsmen of the trades involved at the Contractor's expense.

C. Chases, openings, sleeves, hangers, anchors, recesses, equipment pads, framing for equipment, provided by others only if so noted on the drawings. Otherwise, they will be provided by the Mechanical or Plumbing Contractor for their work.

1.9 COORDINATION

A. This Mechanical and Plumbing Contractors shall plan their work to proceed with a minimum interference with other trades and it shall be their responsibility to inform the General Contractor of all openings required in the building structure for installation of work, and to provide sleeves as required. Dimensions of equipment installed and/or provided by others shall be checked in order that correct clearances and connections may be made.

B. In general, pipelines requiring gravity drainage shall be installed first, followed by ductwork, large piping mains and electrical conduit. The location fire protection piping and heads shall be coordinated with other trades to ensure that installations by other trades do not block heads.

C. Leave sufficient space for the installation of insulation on piping and ductwork as specified. It is not acceptable to compress pipe or duct insulation for any reason.

1.10 CLEANING

A. Keep the job site clean. The Mechanical and Plumbing Contractors shall remove all waste and rubbish associated with their work.

B. Upon completion of work, remove materials, scraps and debris relative to plumbing and mechanical work and leave all spaces including tunnels, crawlspace, pipe or duct chases and ceiling plenums clean and orderly.

C. The Mechanical and Plumbing contractors will be responsible for cleaning the exterior and interior of all equipment prior to start-up. Once all equipment has been cleaned it shall be inspected by the Architect/Engineer prior to start-up.

D. The Mechanical and Plumbing Contractors shall provide dust protection of existing materials and equipment as well as new materials and equipment for the duration of the project. Protect existing materials and equipment from damage for the duration of the project. Clean the exterior and interior of all existing equipment at the completion of the project.

1.11 TEMPORARY FACILITIES

A. Offices
1. The Mechanical and Plumbing Contractor must have the permission of the Owner and General Contractor or Construction Manager to install a temporary office/job trailer on the project site.

2. Contractor shall completely remove his temporary installations when no longer needed and the premises shall be completely clean, disinfected, patched, and refinshed to match adjacent areas.

B. Ladders and Scaffolds
1. The Mechanical and Plumbing Contractors shall provide their own ladders, scaffolds, etc. of substantial construction for access to their work in various portions of the building as may be required. When no longer needed, they shall be removed by the Contractor.

C. Protection Devices
1. The Mechanical and Plumbing Contractors shall provide and maintain his own necessary barricades, fences, signal lights, etc., required by all governing authorities or shown on the drawings. When no longer needed, they shall be removed by the Contractor.

D. TEMPORARY FIRE PROTECTION
1. The Mechanical and Plumbing Contractors shall provide all necessary first aid hand fire extinguishers for Class A, B, C and special hazards as may exist in his own work area only in accordance with good and safe practice and as required by jurisdictional safety authority.

1.12 SUBMITTALS

A. Submittals will be required for each piece of equipment, material or product as noted in the table below.

<table>
<thead>
<tr>
<th>Specification Section</th>
<th>Product Data</th>
<th>Performance Data</th>
<th>Shop Drawing</th>
<th>Delegated Design</th>
<th>Wiring Diagram</th>
<th>Color Chart</th>
<th>Sustainability</th>
<th>Compliance</th>
<th>Notes</th>
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B. Submittal Definitions
1. Product Data: Provide manufacturers cut sheets that include general product information including but not limited to: Model Number, physical data, nominal capacities, rough-in requirements.
2. Performance Data: Provide detailed performance and capacities based on project specific requirements including but not limited to: flow rates, capacities, pressure loss, temperatures, fan curves, pump curves, part load performance, sound data, and electrical characteristics.

3. Shop Drawings: Provide detailed construction and fabrication drawings that show the components that comprise the assembly. The drawings shall detail the required parts and materials, and how all parts and materials are to be assembled.

4. Delegated Design: Provide detailed drawings prepared and stamped by a registered Professional Engineer that detail pertinent design criteria, the materials and products to be installed and the required installation locations.

5. Wiring Diagram: Provide diagrams that identify and detail required field wiring.

6. Color Chart: Provide a physical color chart of material samples required for selection of equipment colors.

7. Sustainability Compliance: Provide literature that indicated a product compliant with LEED or Green Globes. See Division 01 for additional information and requirements.

C. Submittal Formats:
1. Include the following information with each submittal:
   a. Project Name
   b. Submittal Date
   c. Name of Architect
   d. Name of Engineer
   e. Name of General Contractor or Construction Manager
   f. Name of Sub-Contractor
   g. Name of firm or entity that prepared the submittal
   h. Unique Submittal Number
   i. Type of Submittal
   j. Specification Section
   k. Name or Mark of equipment or material and detail or drawings reference.

2. All Submittal with the exception of color charts or material samples shall be electronically transmitted PDFs.

D. Submittal Requirements
1. Submittals shall be complete, clearly show item used, size, dimensions, capacity, rough in, etc., as required for complete check and installation. Manufacturer’s literature showing more than one item shall be clearly marked as to which item is being furnished or it will be rejected and returned without review.

2. Each submittal shall be thoroughly checked by the Contractor for compliance with the Contract Document requirements, accuracy of dimensions, relationship to the work of other trades, and conformance with sound, safe practices as to erection and installation. Each submittal shall then bear a stamp evidencing such checking and shall show corrections made, if any. Submittals requiring extensive
corrections shall be revised before submission. Each submittal not stamped and signed by the Contractor evidencing such checking will be rejected and returned without review.

3. On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

4. Review of the shop drawings and literature by the engineer shall not relieve the contractor for responsibility for deviations for the drawings or specifications, nor shall it relieve the contractor from responsibility for errors in the shop drawings or literature. It is the responsibility of the contractor to provide materials and equipment which meet the specifications and job requirements.

1.13 OPERATION AND MAINTENANCE MANUALS

A. Operation and Maintenance Manuals (O&M Manuals) shall contain:
1. Names and contact information for the Project Architect, Project Engineer.
2. Names and contact information for the General Contractor or Construction Manager.
3. Names and contact information for sub-contractors.
4. Installation, maintenance and operating instructions for each piece of equipment.
5. Parts lists
6. Wiring Diagrams
7. Equipment Start-up and inspection certificates
8. Test and Balance Reports
9. Commissioning Reports
10. Copies of Equipment Warranties
11. Copies of Submittals
12. Record Drawings.

B. Prior to substantial completion submit an electronic copy of the O&M manual in PDF format to the Architect, Engineer and Owner for Review and approval. The PDF shall be one file with an index and hyperlinks to each section. Individual bound PDFs without automated navigation will be rejected.

C. Prior to final payment a final electronic copy of the O&M manual on an archival quality DVD as well as two printed copies shall be furnished to the owner. Printed copies shall have commercial quality 8-1/2” x 11” 3-ring binders with tabbed dividers for each section.

1.14 AS-BUILT RECORD DRAWINGS

A. The Contractor shall furnish to the Owner and Architect/Engineer a marked print showing the location of all concealed or underground pipe or conduit runs and other equipment installed other than as shown on the drawings. Dimension underground lines from established building lines. Indicate all installed pull boxes in conduit runs.
B. The Contractor shall furnish to the Architect/Engineer a marked print showing the location of all mechanical equipment, plumbing fixtures, piping, ductwork, diffusers, grilles, etc. The location of any item which deviates from the bid documents shall be accurately drawn and dimensioned.

C. All underground piping and ductwork shall be dimensioned from nearest column and/or exterior walls. The location of all maintenance related items such as duct access doors, fire dampers, isolation valves, filters, etc., shall be highlighted on as built drawing.

1.15 PLACING SYSTEM INTO OPERATION

A. Prior to starting of equipment the Mechanical of Plumbing Contractor shall thoroughly inspect the installation and any work completed by other trades and subcontractors to verify compliance with the contract documents.

B. Start-up of all HVAC equipment shall be completed by factory trained representatives. At the completion of start-up, the factory representative shall submit to the architect and engineer, a start-up report that indicates any problems encountered, potential problems including installation issues, adjustments made or required to be made to ensure proper operation. Any installation deficiencies identified shall be corrected at no additional cost to the owner.

1.16 OWNER TRAINING

A. General
1. The system training is intended to familiarize the Owner’s operating and maintenance staff with all systems requiring maintenance. Training is to be provided after the systems are in place and operational, after issues noted during commissioning have been resolved, and before final acceptance.
2. Provide second set of training sessions for automatic control systems about 6-9 months after the first sessions.

B. Systems Requiring Training
1. All mechanical, electrical, safety, standby, and automatic control systems in the project, and other systems specified elsewhere to have training.

C. Attendance:
1. Training is to be provided by contractor’s representatives that are familiar with the system’s operation and maintenance requirements. Individual training sessions (modules) are to be provided for each type or group of systems, separated roughly by trade group that will be performing maintenance on the system. The trades groups and systems typically requiring training are:
   a. HVAC & Refrigeration (Hydronic and or steam heating systems, refrigeration, chilled water, packaged cooling systems, fan systems, controls)
   b. Plumbers (Domestic and Sanitary Plumbing, gas-fired heating, miscellaneous process piping systems)
D. Schedule:
1. Duplicate training sessions are to be provided for each training module, so that Owner’s operating personnel can be split into two groups during training. Duplicate training sessions to be scheduled on different days. Length of training sessions will be determined by scope of training indicated below, and as coordinated with Owner after draft copy of training documents have been reviewed.

E. Training Documentation:
1. Contractor to submit draft copy of agenda and training documents to Owner for review at least two weeks prior to training date.
2. Provide a copy of the following items for each person that will be attending the training sessions. Coordinate required number with the Owner.
   a. Training agenda.
   b. Summary of new systems and existing systems affected by this project.
   c. Summary of work performed under this project.
   d. Control system drawings and sequences of operation.
   e. List of important maintenance and trouble-shooting operations for all systems.
3. Provide minimum of 2 copies of following items:
   a. Contract documents including all drawings, specifications, addendums, and change orders.

F. Training Sessions:
1. Assemble at location to be determined by the Owner.
2. Distribute training documentation as indicated above.
3. Provide classroom style training if required for orientation, discussion of new systems and existing systems affected by this project, and other issues appropriate for a classroom format.
4. Visit site and review locations, and perform detailed review of operation and maintenance requirements for current systems.

1.17 WARRANTY

A. The Contractor shall guarantee that all materials and labor installed are new and of first quality and that any material or labor found defective shall be replaced without cost to the Owner within one (1) year after substantial completion of the Contract or one (1) full season of heating and cooling operation, whichever is the greater. The guarantee shall list the date of the beginning of the one (1) year period, which shall be the date that the Substantial Completion Certificate is issued.

B. Any damage to the building, caused by defective work or material of the Contractor within the above-mentioned period, shall be satisfactorily repaired without cost to the Owner.

C. The guarantee does not include maintenance of equipment. The Owner shall accept full responsibility for proper operation and maintenance of equipment immediately upon substantial completion and occupancy of the building.
D. Final acceptance by the Owner will not occur until all operating instructions are mounted in Equipment Rooms and Operating Personnel thoroughly indoctrinated in the operation of all mechanical equipment by the Contractor.

E. No equipment installed as part of this project shall be used for temporary heat during construction.

END OF SECTION 220000
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following:
1. Expansion Fittings and Loops for Piping Systems
2. Alignment Guides and Anchors
3. Dielectric Fittings
4. Pipe Sleeves
5. Sleeve Seals Systems for Piping
6. Silicone Sealant
7. Escutcheons for Piping
8. Floor Plates

1.2 SUBMITTALS

A. See Section 220000 “General Requirements of Plumbing and HVAC” for Submittal requirements.

B. Delegated-Design Submittal: For each anchor and alignment guide 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. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
3. Alignment Guide Details: Detail field assembly and attachment to building structure.
4. Schedule: Indicate type, manufacturer’s number, size, material, pressure rating, end connections, and location for each expansion joint.

1.3 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

1.4 PERFORMANCE REQUIREMENTS
A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

PART 2 - PRODUCTS

2.1 EXPANSION FITTINGS AND LOOPS FOR PIPING SYSTEMS

A. Rubber Union Connector Expansion Joints

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   
   a. Mason Industries, Inc.
   b. MetraFlex.
   c. Twin City Hose.


3. Minimum Pressure Rating: 150 psig at 170 deg F, unless otherwise indicated.

4. End Connections for NPS 2 and Smaller: Threaded.

B. Flexible-Hose Packless Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Mason Industries, Inc.
   b. Metraflex Company (The).
   c. Twin City Hose Inc.

2. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.

3. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.

4. Expansion Joints for Copper Tubing NPS 2 and Smaller: Copper-alloy fittings with solder-joint end connections.

   a. Bronze hoses and single-braid bronze sheaths with 450 psig at 70 deg F and 340 psig at 450 deg F ratings.

5. Expansion Joints for Copper Tubing NPS 2-1/2 to NPS 4: Copper-alloy fittings with threaded end connections.

   a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 300 psig at 70 deg F and 225 psig at 450 deg F ratings.
   a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 450 psig at 70 deg F and 325 psig at 600 deg F ratings.

7. Expansion Joints for Steel Piping NPS 2-1/2 to NPS 6: Carbon-steel fittings with flanged end connections.
   a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 200 psig at 70 deg F and 145 psig at 600 deg F ratings.

2.2 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides

1. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding slider for bolting to pipe.

B. Anchor Materials:

1. Steel Shapes and Plates: ASTM A 36/A 36M.
2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.

5. Chemical Fasteners: Insert-type stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.
   a. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.

2.3 DIELECTRIC FITTINGS
A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
   1. Dielectric Unions are not allowed.

C. Dielectric Flanges:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Capitol Manufacturing Company; member of the Phoenix Forge Group.
      b. Central Plastics Company.
      c. Matco-Norca.
      d. Watts; a division of Watts Water Technologies, Inc.
      e. Wilkins; a Zurn company.
   3. Factory-fabricated, bolted, companion-flange assembly.
   4. Pressure Rating: 175 psig (1200 kPa).
   5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Advance Products & Systems, Inc.
      b. Calpico, Inc.
      c. Central Plastics Company.
      d. Pipeline Seal and Insulator, Inc.
   2. Nonconducting materials for field assembly of companion flanges.
   4. Gasket: Neoprene or phenolic.
   5. Bolt Sleeves: Phenolic or polyethylene.

E. PEX Dielectric Separator:
   1. Description: 6" long section of pex piping shall be installed between dis-similar piping materials.
   2. Pipe Material: PEX plastic according to ASTM F 876.
   3. Oxygen Barrier: O2 permeability <= 0.32 mg/m2/day in accordance with DIN 4726.
   5. Pressure/Temperature Rating: Minimum 100 psig and 180 deg F.
2.4 SLEEVES
   A. Galvanized-Steel Sheet Pipe Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

2.5

2.6 SLEEVE-SEAL SYSTEMS
   A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1. Advance Products & Systems, Inc.
      2. CALPICO, Inc.
      3. GPT; an EnPro Industries company.
      4. Metraflex Company (The).
   B. Description:
      1. Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
      2. Designed to form a hydrostatic seal of 20-psig (137-kPa) minimum).
      3. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size.
      4. Pressure Plates: Composite plastic.
      5. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.7 SILICONE SEALANTS
   A. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT. Grade P Pourable (self-leveling) formulation is for opening in floors and other horizontal surfaces that are not fire rated.

2.8 ESCUTCHEONS
   A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
   B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
   C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.9 FLOOR PLATES
A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

PART 3 - EXECUTION

3.1 EXPANSION JOINT INSTALLATION

A. Install expansion joints of sizes matching sizes of piping in which they are installed.
B. Install expansion joint per the manufacture’s written instructions.

3.2 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.
B. Install two guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four (4) pipe diameters from expansion joint.
C. Attach guides to pipe, and secure guides to building structure.
D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.
E. Anchor Attachments:
   2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24; U bolts bolted to anchor.
F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.
   1. Anchor Attachment to Steel Structural Members: Attach by welding.
   2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer’s written instructions.
G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

3.3 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
B. Install Dielectric fittings per the manufacturers written instructions.
C. Install pipe hangers immediately upstream and downstream of dielectric fittings.
D. Install isolation valves immediately upstream and downstream of dielectric fittings.

E. Dielectric Fittings for NPS 2 and Smaller: PEX Dielectric Separator.

F. Dielectric Fittings for NPS 2-1/2 and Larger: Dielectric Flange.

3.4 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

   a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Using silicone sealant, seal space outside of sleeves in slabs and walls without sleeve-seal system.

D. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke-Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

3.5 SLEEVE-SEALS SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls at piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal-system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.6 SLEEVE-SEAL SCHEDULE

A. Use sleeve and sleeve-seals for the following piping-penetration applications:

   1. Exterior Concrete Walls Above Grade: Galvanized-Steel Sheet Pipe Sleeves with Sleeve-seal system
2. Exterior Concrete Walls Below Grade: Galvanized-Steel Sheet Pipe Sleeves with Sleeve-seal system
3. Interior or Exterior Concrete Slabs-on-Grade: Sleeve not required.
4. Interior Concrete Slabs Above Grade: Galvanized-Steel Sheet Pipe Sleeves with Silicone Sealant or Fire calk
5. Interior Partitions: Sleeve not require – fire calk penetrations of rated assemblies.

3.7 ESCUTCHEON INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

3.8 FLOOR PLATE INSTALLATION

A. Install floor plates for piping penetrations of equipment-room floors.
B. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

END OF SECTION 220500
SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY
   A. Section Includes:
      1. Pipe, tube, and fittings.
      2. Specialty pipe fittings.

1.2 ACTION SUBMITTALS
   A. See section 220000 “General Requirements of Plumbing and HVAC” for submittal requirements.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
   A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
   B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7. See section 220548 “Vibration and Seismic Controls for Plumbing and HVAC Piping and Equipment”

2.2 PIPING MATERIALS
   A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
   B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS
   A. Pipe and Fittings: ASTM A 888 or CISPI 301.
   B. CISPI, Hubless-Piping Couplings:
2. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 COPPER TUBE AND FITTINGS

A. Copper Type DWV Tube: ASTM B 306, drainage tube, drawn temper.

B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

C. Copper Pressure Fittings:
   2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

D. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
   1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
   2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

E. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.5 PVC PIPE AND FITTINGS


B. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

D. Adhesive Primer: ASTM F 656.

E. Solvent Cement: ASTM D 2564.

2.6 SPECIALTY PIPE FITTINGS

A. Transition Couplings:
   1. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
2. Unshielded, Nonpressure Transition Couplings:
   b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
   c. End Connections: Same size as and compatible with pipes to be joined.
   d. Sleeve Materials:
      2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
      3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

3. Shielded, Nonpressure Transition Couplings:
   b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
   c. End Connections: Same size as and compatible with pipes to be joined.

PART 3 - EXECUTION

3.1 EARTH MOVING
   A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION
   A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
      1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
      2. Install piping as indicated unless deviations to layout are approved on coordination drawings.
   B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
   C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
   D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
E. Install piping to permit valve servicing.
F. Install piping at indicated slopes.
G. Install piping free of sags and bends.
H. Install fittings for changes in direction and branch connections.
I. Install piping to allow application of insulation.
J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
K. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.
   1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
   2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.
      a. Straight tees, elbows, and crosses may be used on vent lines.
   3. Do not change direction of flow more than 90 degrees.
   4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
      a. Reducing size of waste piping in direction of flow is prohibited.
L. Lay buried building waste piping beginning at low point of each system.
   1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
   2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
   3. Maintain swab in piping and pull past each joint as completed.
M. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:
   1. Horizontal Sanitary Waste: 1/4” per foot downward in direction of flow. 1/8” per foot is allowable if necessitated by site conditions.
   2. Vent Piping: 1/8” per foot down toward vertical fixture vent or toward vent stack.
N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
O. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."
P. Install aboveground PVC piping according to ASTM D 2665.
Q. Install underground PVC piping according to ASTM D 2321.

R. Plumbing Specialties:
   1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.
      a. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."

S. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

T. Install sleeves for piping penetrations of walls, ceilings, and floors.
   1. Comply with requirements for sleeves specified in Section 220500 "General Provisions of Plumbing and HVAC."

U. Install sleeve seals for piping penetrations of concrete walls and slabs.
   1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

V. Install escutcheons for piping penetrations of walls, ceilings, and floors.
   1. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION


B. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

C. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

D. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
   1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
   2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
   3. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 appendixes.
3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in ODs.

3.5 VALVE INSTALLATION

A. Comply with requirements in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13 "Butterfly Valves for Plumbing Piping," Section 220523.14 "Check Valves for Plumbing Piping," and Section 220523.15 "Gate Valves for Plumbing Piping" for general-duty valve installation requirements.

B. Shutoff Valves:

1. Install shutoff valve on each sewage pump discharge.
2. Install gate or full-port ball valve for piping NPS 2 and smaller.
3. Install gate valve for piping NPS 2-1/2 and larger.

C. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing and HVAC Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing and HVAC Piping and Equipment."

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Install individual, straight, horizontal piping runs:
   a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
   c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

G. Install supports for vertical cast-iron soil piping every 15 feet.

H. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 72 inches with 3/8-inch rod.
2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
3. NPS 2-1/2: 108 inches with 1/2-inch rod.
4. NPS 3 and NPS 5: 10 feet with 1/2-inch rod.
5. NPS 6: 10 feet with 5/8-inch rod.
6. NPS 8: 10 feet with 3/4-inch rod.

I. Install supports for vertical copper tubing every 10 feet.

J. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
2. NPS 3: 48 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 48 inches with 7/8-inch rod.

K. Install supports for vertical PVC piping every 48 inches.

L. Support piping and tubing not listed above according to MSS SP-58 and manufacturer's written instructions.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect waste and vent piping to the following:

1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.

3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.

4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.

5. Equipment: Connect waste piping as indicated.
   a. Provide shutoff valve if indicated and union for each connection.
   b. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:
   1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
   2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping.

B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing and HVAC Piping and Equipment."

3.9 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
   1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
   2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary waste and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
   1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.
a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.
   a. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.
   a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
   b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
   c. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.
   a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg.
   b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
   c. Air pressure must remain constant without introducing additional air throughout period of inspection.
   d. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

6. Prepare reports for tests and required corrective action.

3.10 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

E. Repair damage to adjacent materials caused by waste and vent piping installation.
### PIPING SCHEDULE

A. Piping system materials are identified in the table below. If more than one material is listed, selection from the materials listed is at the Contractor’s option.

<table>
<thead>
<tr>
<th>Application</th>
<th>Location</th>
<th>Size</th>
<th>Material</th>
<th>Fittings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanitary Waste and Vent</td>
<td>Below Grade</td>
<td>All</td>
<td>PVC</td>
<td>Solvent Joint</td>
</tr>
<tr>
<td>Sanitary Waste and Vent with High Temp Discharge (120F – 140F)</td>
<td>Below Grade</td>
<td>All</td>
<td>Cast Iron</td>
<td>No-Hub</td>
</tr>
<tr>
<td>Grease Waste</td>
<td>Below Grade</td>
<td>All</td>
<td>Cast Iron</td>
<td>No-Hub</td>
</tr>
<tr>
<td>Sanitary Waste and Vent</td>
<td>Above Grade</td>
<td>All</td>
<td>Cast Iron</td>
<td>No-Hub</td>
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<td>All</td>
<td>Cast Iron</td>
<td>No-Hub</td>
</tr>
</tbody>
</table>

END OF SECTION 221316
SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cleanouts.

B. Related Requirements:
   1. Section 221316 “Sanitary Waste and Vent Piping”

1.2 SUBMITTALS

A. See Section 220000 “General Requirements of Plumbing and HVAC” for submittal requirements.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic sanitary waste piping specialty components.

2.2 CLEANOUTS

A. Above Grade Wall Cleanout
   1. Provide JR Smith 4422 or approved equal
   2. Description: Cast iron caulked spigot ferrule with cast bronze taper thread plug and stainless steel round cover and screw.

B. Finished Floor Cleanout
   1. Provide JR Smith 4100 or approved equal
   2. Description: Cast iron cleanout with extra heavy duty round, adjustable, scoriated, secured nickel bronze top, and no-hub outlet, gasket seal bronze plug and flashing clamp for.

C. Outdoor Cleanout
   1. Provide JR Smith 4241S or approved equal
   2. Description: Cast iron floor level cleanout assembly with heavy duty, round, adjustable, scoriated cast iron top, non-tilt tractor cover, gasket seal bronze plug.
2.3 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains or Hub Drains:
   1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-less, cast-iron soil-pipe fittings. Include P-trap, riser section; and where required, increaser fitting joined with ASTM C 564 rubber gaskets.
   2. Size: See drawings. If not shown drain shall 2” minimum or one size larger than piping discharging to the drain.

B. Floor-Drain, Trap-Seal Primer Fittings:
   1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
   2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

C. Floor-Drain, Trap Seal:
   1. Barrier type floor drain or sink trap seal device.
   2. IAPMO 7479 and ASSE std. 1072 listed.

D. Air-Gap Fittings:
   1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
   2. Body: Bronze or cast iron.
   3. Inlet: Opening in top of body.
   4. Outlet: Larger than inlet.
   5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

E. Expansion Joints:
   2. Body: Cast iron with bronze sleeve, packing, and gland.
   3. End Connections: Matching connected piping.
   4. Size: Same as connected soil, waste, or vent piping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
   1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
   2. Locate at each change in direction of piping greater than 45 degrees.
   3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts shall be installed with top flush and level with finished floor. It shall be the responsibility of the plumbing contractor to coordinate the installation of cleanouts with the general contractor and flooring contractor to ensure that floor cleanouts are properly adjusted so that the top is flush and level with finished flooring material. Cleanout covers that are not flush and level with the finished floor will be rejected and the plumbing contractor will be required to sawcut or core drill the floor, provide and install new cleanout, coordination installation of new concrete and new finished flooring material at no cost to the owner.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Coordinate installation of roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof with the general contractor or construction manager.

E. Assemble open drain fittings and install with top of hub 2 inches above floor.

F. Install deep-seal traps on floor drains and other waste outlets, if indicated.

G. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
   1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
   2. Size: Same as floor drain inlet.

H. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

I. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

J. Install wood-blocking reinforcement for wall-mounting-type specialties.

K. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
3.3 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319
PART 1 - GENERAL

1.1 SUMMARY
   
   A. Section Includes:
      
      1. Grease interceptors.

1.2 SUBMITTALS
   
   A. See section 220000 “General Requirements or Plumbing and HVAC” for submittal requirements.

PART 2 - PRODUCTS

2.1 GREASE INTERCEPTORS
   
   A. Precast Concrete Grease Interceptors:
      
      1. Include rubber-gasketed joints, vent connections, manholes, compartments or baffles, absorbent pillows and piping or openings to retain grease, sand & oil and to permit wastewater flow.
      2. Structural Design Loads:
      3. Resilient Pipe Connectors: ASTM C 923, cast or fitted into interceptor walls, for each pipe connection.
      5. Steps: FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of interceptor to finished grade is less than 60 inches.
      6. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover.
      7. Manhole Frames and Covers: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch-minimum width flange and 26-inch-diameter cover.
         a. Ductile Iron: ASTM A 536, Grade 60-40-18, unless otherwise indicated.
         c. Include indented top design with lettering cast into cover, using wording equivalent to “GREASE INTERCEPTOR” or “SAND & OIL INTERCEPTOR”.
2.2 PRECAST CONCRETE MANHOLE RISERS

A. Precast Concrete Manhole Risers: ASTM C 478 and ASTM C 913, with rubber-gasket joints.
   1. Structural Design Loads:
   2. Length: From top of underground concrete structure to grade.
   3. Riser Sections: 3-inch minimum thickness and 36-inch diameter.
   4. Top Section: Eccentric cone, unless otherwise indicated. Include top of cone to match grade ring size.
   5. Gaskets: ASTM C 443, rubber.

B. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, diameter matching manhole frame and cover, and height as required to adjust the manhole frame and cover to indicated elevation and slope.

C. Manhole Frames and Covers: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch-minimum width flange and 26-inch-diameter cover.
   1. Ductile Iron: ASTM A 536, Grade 60-40-18, unless otherwise indicated.
   3. Include indented top design with lettering cast into cover, using wording equivalent to the following:
      a. Grease Interceptors in Sanitary Sewerage System: "GREASE INTERCEPTOR."

PART 3 - EXECUTION

3.1 EARTHWORK
   A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 INSTALLATION
   A. Install precast concrete interceptors according to ASTM C 891.
   B. Set interceptors level and plumb.
   C. Install manhole risers from top of underground concrete interceptors to manholes and gratings at finished grade.
   D. Set tops of manhole frames and covers flush with finished surface in pavements.
      1. Set tops 3 inches above finish surface elsewhere unless otherwise indicated.
   E. Set tops of grating frames and grates flush with finished surface.
F. Install grease interceptors, according to authorities having jurisdiction and with clear space for servicing.
   1. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.

3.3 CONNECTIONS

A. Piping installation requirements are specified in Section 221316 "Sanitary Waste and Vent Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Make piping connections between interceptors and piping systems.

3.4 IDENTIFICATION

A. Identification materials and installation are specified in Section 312000 "Earth Moving."
   1. Arrange for installation of green warning tapes directly over piping and at outside edges of underground interceptors.
   2. Use warning tapes or detectable warning tape over ferrous piping.
   3. Use detectable warning tape over nonferrous piping and over edges of underground structures.

END OF SECTION 221323
SECTION 224100 – PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Plumbing fixtures shown and scheduled on the drawings.

1.2 SUBMITTALS
A. See section 220000 “General Requirements of Plumbing and HVAC” for submittal requirements.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES
A. Manufacturers: The plumbing fixtures listed in the plumbing fixture schedule are the basis of design. The following is a list of approved manufacturers. Fixtures of equal quality, performance, function and aesthetics from these manufacturers may be bid. Manufacturers not listed below must submit for approval prior to bidding. See Div 01 for Prior Approval Requirements.

B. FLOOR DRAINS & SINK
   1. FIXTURES
      a. JR SMITH
      b. ZURN
      c. SIOUX CHEIF
   2. TRAP SEAL
      a. TRAP GUARD
      b. JR SMITH
   3. TRAP PRIMERS
      a. JR SMITH
      b. WATTS
      c. ZURN

2.2 GROUT
B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install plumbing fixtures level and plumb according to roughing-in drawings.

B. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes unless otherwise indicated.

C. For floor drains and floor sinks, install top or strainer flush and level with finished floor. It shall be the responsibility of the plumbing contractor to coordinate the installation of floor drains and sinks with the general contractor and flooring contractor to ensure that floor drains and sinks are properly adjusted so that the top or strainer is flush and level with finished flooring material. Floor drains or sinks that are not flush and level with the finished floor will be rejected and the plumbing contractor will be required to sawcut or core drill the floor, provide and install new floor drain or sink and coordinate the installation of new concrete and new finished flooring material at no cost to the owner.

3.2 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks.

3.3 ADJUSTING

A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.
3.4 CLEANING AND PROTECTION

A. Protect floor drains and sinks from intrusion of construction materials or debris during construction. All floor drain and sinks shall be covered with protective material until finished flooring materials have been installed.

B. After completing installation of plumbing fixtures, inspect and repair damaged finishes.

C. Clean plumbing fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

D. Provide protective covering for installed plumbing fixtures and fittings.

E. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224100
SECTION 260513 - MEDIUM-VOLTAGE CABLES

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes cables, splices, terminations, and accessories for medium-voltage electrical distribution systems.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of cable, splice and termination.

1.03 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with IEEE C2 and NFPA 70.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   Cables:

   a. Cablec.
   b. Kerite Co. (The); Hubbell Incorporated.
   c. Okonite Company (The).
   d. Pirelli Cables & Systems NA.

   Cable Splicing and Terminating Products and Accessories:

   e. Engineered Products Co.
   f. Raychem Corp.; Telephone Energy and Industrial Division.
   g. RTE Components; Cooper Power Systems, Inc.

2.02 CABLES

A. Cable Type: MV90, with copper conductor and compact round, concentric lay, class B stranding.
1. Solid copper wires shall be spirally applied to provide neutral rating equal to 1/3 of the cable conductor current rating. Min 18 - #14 AWG shall be applied on 4/0 AWG conductor.

B. Comply with UL-1072, AEIC CS8, ICEA S-94-649, ICEA S-97-682, and ASTM B-8

C. Conductor Insulation: Ethylene-propylene rubber.
   1. Voltage Rating: 15 kV.
   2. Insulation Thickness: 220 mils.
   3. Insulation shall be extruded and vulcanized with the conductor and insulation screens.
   4. The minimum average insulation thickness shall be 220 mils with the minimum thickness at any cross-section of the insulation not less than 90% of the average thickness.

D. Conductor Screen: Extruded layer of semiconducting thermosetting compound with volume resistivity not in excess of 50,000 ohm-cm at 90°C shall be applied at a minimum average thickness of 15 mils. Screen shall be free-stripping from the conductor and firmly bonded to the insulation. Optionally, under the extrusion, there may be a layer of semi-conducting tape applied over the conductor.

E. Insulation Screen: Insulation screen shall be an extruded thermosetting compound with volume resistivity not in excess of 50,000 ohm-cm at 90°C when tested per AEIC CS-8. The elongation after an air oven test at 121°C for 168 hours shall be 100 percent minimum and the brittleness temperature shall be less than -30°C. The screen shall be extruded directly over the insulation. Minimum average thickness of the insulation screen shall be in accordance with ICEA S-94-649. Insulation screen shall be printed in ink at 24 inch maximum increments "Semi-Conducting -Remove when Splicing or Terminating."

F. Shielding: Solid copper wires, helically applied over semiconducting insulation shield.

G. Cable Jacket: Minimum 80mil Chlorosulfonated polyethylene, CPE.
   1. An identifying legend shall be printed on the jacket with contrasting ink indicating the manufacturer, cable type, insulation thickness, conductor size and type, rated voltage, sequential footage number, and year of manufacture.

2.03 SOLID TERMINATIONS

A. Shielded-Cable Terminations: Comply with the following classes of IEEE 48. Insulation class is equivalent to that of cable. Include shield ground strap for shielded cable terminations.
   1. Class 1 Terminations: Modular type, furnished as a kit, with stress-relief tube; multiple, molded-silicone rubber, insulator modules; shield ground strap; and compression-type connector.
   2. Class 1 Terminations: Heat-shrink type with heat-shrink inner stress control and outer nontracking tubes; multiple, molded, nontracking skirt modules; and compression-type connector.
3. Class 1 Terminations: Modular type, furnished as a kit, with stress-relief shield terminator; multiple-wet-process, porcelain, insulator modules; shield ground strap; and compression-type connector.

2.04 SEPARABLE INSULATED CONNECTORS

A. Description: Modular system, complying with IEEE 386, with disconnecting, single-pole, cable terminators and with matching, stationary, plug-in, dead-front terminals designed for cable voltage and for sealing against moisture.

B. Load-Break Cable Terminators: Elbow-type units with 200-A load make/break and continuous-current rating. Include test point on terminator body that is capacitance coupled.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install cables according to IEEE 576.

B. Pull Conductors: Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values. Pulling tension shall be monitored and recorded during the cable pulling process.

C. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

D. Support cables according to Section 26 05 29 "Hangers and Supports for Electrical Systems."

E. In manholes, handholes, pull boxes, junction boxes, and cable vaults, train cables around walls by the longest route from entry to exit.

F. Install cable splices at pull points and elsewhere as indicated; use standard kits.

G. Install separable insulated-connector components as follows:
   1. Protective Cap: At each terminal junction, with one on each terminal to which no feeder is indicated to be connected.

H. System grounding assemblies shall be installed at all transformers, switchgear and manhole locations.
   1. Grounding assemblies shall consist of 4 -10 foot copperclad ground rods driven in undisturbed soil. A direct buried, 1/0 copper ground wire shall connect ground rods to the primary cable neutral wires, the secondary neutral, and all groundable parts of the equipment. The ground wire shall be routed so as to provide a ground plane for personnel operating the equipment.
2. A five pound magnesium sacrificial anode shall be installed for passive, cathodic protection of the ground rods. Electrical connection of the anode to the ground system shall be made at the ground bus inside the equipment enclosure.

I. Ground shields and metal bodies of shielded cable at terminations, splices, and separable insulated connectors.

J. Identify cables according to Section 26 05 53 "Identification for Electrical Systems."
   1. **Cables shall be identified and tagged at each end.** Identification shall include: CIRCUIT ("CKT9C"); PHASE ("PhA, PhB, PhC"); and DESTINATION STATION NUMBER ("ToSTA9C-3A"). Tags shall not start with the word "FROM". Tags shall be securely attached to cable with tie wraps. Tagging system materials shall be Reliable Type S-850.

3.02 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:
   1. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.2. Certify compliance with test parameters.
   2. In addition to tests required in NETA ATS and elsewhere in this specification MSU Requires the following tests:
      **Factory Tests:**
      a. Conductor de resistance test in accordance with ICEA S-94-649.
      b. High voltage ac and dc tests (5 min. 33 kVAC, 15 min. - 80 kV DC).
      c. Insulation resistance shall be measured and recorded in megohms - 100 feet and when corrected to 60°C the SIR shall not be less than 50,000 megohms - 1000 feet.
      d. Resistance of the completed cable concentric neutral system shall be measured and recorded.
      e. Completed cable shall be tested for corona discharge and shall comply with AEIC requirements. Manufacturer shall provide qualifying X-Y plot recording chart.

      **Field Tests:**
      f. Continuity Testing: After installation of the cable, terminations, and identification tagging but prior to the high potential test described below, the contractor shall conduct a continuity test on the system by grounding the conductor at the source and checking for continuity from the end of each conductor with an ohmmeter. Cable tagging shall be checked for accuracy at this time.
      g. High Potential Test: After successful continuity tests, DC high potential tests shall be performed by the Contractor and witnessed by the Owner's Representative. Tests will be conducted on each completed length of cable, with terminations in place but disconnected from the system. New cables shall be tested with a test voltage of 50 kV DC for fifteen (15) minutes. Prior to test, verify that the test voltage does not exceed the manufacturers recommendation for the cable terminals. Where new cables are spliced into existing cables, test voltage shall be reduced to a 20 kV. Do not test any existing cables that have solid dielectric insulation or cross-
linked polyethylene (XLPW/RXLPW) insulation as the cable may be damaged if tested.

h. The contractor shall provide all test equipment and labor required for testing the cables. Any cables or terminations that fail the test shall be replaced by the contractor at no cost to MSU.

i. All tests shall be conducted per NETA test standards and shall be scheduled with MSU three weeks prior to the test. Provide written test report.

j. High Voltage Phase Test: After successful completion of continuity and high potential tests, the contractor shall conduct a high voltage phase test at normal line voltage to verify that segments of the system can be paralleled together

END OF SECTION
SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Building wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.01 CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Alcan Products Corporation; Alcan Cable Division.
   2. Alpha Wire.
   3. Belden Inc.
   5. General Cable Technologies Corporation.

B. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

C. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THW-2 Type THHN-2-THWN-2 Type XHHW-2 Type UF Type USE and Type SO.

D. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for metal-clad cable, Type MC nonmetallic-sheathed cable, Type NM Type SO and Type USE with ground wire.

2.02 CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. AFC Cable Systems, Inc.
2. Gardner Bender.
4. Ideal Industries, Inc.
5. Ilsco; a branch of Bardes Corporation.
6. NSi Industries LLC.
7. O-Z/Gedney; a brand of the EGS Electrical Group.
8. 3M; Electrical Markets Division.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.03 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 - EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-2-THWN-2, single conductors in raceway.

B. Feeders: Type THHN-2-THWN-2, single conductors in raceway.

C. Branch Circuits: Type THHN-2-THWN-2, single conductors in raceway.

D. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

3.03 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 26 0533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 26 0529 "Hangers and Supports for Electrical Systems."

G. Provide a dedicated neutral conductor for each 120v branch circuit.

3.04 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.05 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 26 0553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.06 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies according to Section 260544.

3.07 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating.

3.08 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Perform each visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
B. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION
SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Conduit, ducts, and duct accessories for concrete-encased duct banks.
   2. Handholes and boxes.

1.02 RELATED REQUIREMENTS

A. Section 312000 – Earth Moving
B. Section 312310 – Pipe Trench Excavation and Backfill

1.03 ACTION SUBMITTALS

A. Product Data: For accessories for manholes, handholes, and boxes.
B. Shop Drawings for Precast or Factory-Fabricated Underground Utility Structures: Include plans, elevations, sections, details, attachments to other work, and accessories, including the following:
   1. Duct entry provisions, including locations and duct sizes.
   2. Reinforcement details.
   3. Frame and cover design and manhole frame support rings.
   5. Dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
C. Shop Drawings for Factory-Fabricated Handholes and Boxes: Include dimensioned plans, sections, and elevations, and fabrication and installation details, including the following:
   1. Duct entry provisions, including locations and duct sizes.
   2. Cover design.
   4. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

1.04 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.05 QUALITY ASSURANCE

A. Comply with ANSI C2.
B. Comply with NFPA 70.
PART 2 - PRODUCTS

2.01 CONDUIT


B. RNC:
   1. In Duct Banks: NEMA TC 6, **Type EB-60-PVC**, UL 651, with matching fittings by the same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.
   2. Direct Bury: Type EPC-40-PVC or Type EPC-80-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
   3. Transitioning thru slab: Raceway shall transition from PVC to RGS prior to being exposed, where subject to harm.

2.02 NONMETALLIC DUCTS AND DUCT ACCESSORIES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. ARNCO Corp.
   2. Beck Manufacturing.
   3. Cantex, Inc.
   6. ElecSys, Inc.
   7. Electri-Flex Company.
   8. IPEX Inc.
   9. Lamson & Sessions; Carlon Electrical Products.
   10. Manhattan/CDT; a division of Cable Design Technologies.
   11. Spiraduct/AFC Cable Systems, Inc.

C. Underground Plastic Utilities Duct: NEMA TC 6 & 8, Type EB-20-PVC, ASTM F 512, UL 651A, with matching fittings by the same manufacturer as the duct, complying with NEMA TC 9.

D. Duct Accessories:
   1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and selected to provide minimum duct spacings indicated while supporting ducts during concreting or backfilling.
   2. Warning Tape: Underground-line warning tape specified in Section 26 05 53 "Identification for Electrical Systems."
   3. Concrete Warning Planks: Nominal 12 by 24 by 3 inches in size, manufactured from 6000-psi concrete.
      b. Mark each plank with " ELECTRIC " in 2-inch- high, 3/8-inch- deep letters.
2.03 HANDHOLES AND BOXES

A. Description: Comply with SCTE 77.
   1. Color: **Green**.
   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, **ELECTRIC**.
   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. Fiberglass Handholes and Boxes with Polymer Concrete Frame and Cover: Sheet-molded, fiberglass-reinforced, polyester resin enclosure joined to polymer concrete top ring or frame.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
      a. Armorcast Products Company.
      b. Carson Industries LLC.
      c. Christy Concrete Products.
      d. Synertech Moulded Products, Inc.; a division of Oldcastle Precast.

2.04 UTILITY STRUCTURE ACCESSORIES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Bilco Company (The).
   2. Campbell Foundry Company.
   4. Riverton Concrete Products; a division of Cretex Companies, Inc.
   5. Strongwell Corporation; Lenoir City Division.
   6. Utility Concrete Products, LLC.
   8. Anderson Precast

C. Pulling Eyes in Concrete Walls: Eyebolt with reinforcing-bar fastening insert, 2-inch-diameter eye, and 1-by-4-inch bolt.
1. Working Load Embedded in 6-Inch, 4000-psi Concrete: 13,000-lbf minimum tension.

D. Pulling Eyes in Nonconcrete Walls: Eyebolt with reinforced fastening, 1-1/4-inch-diameter eye, rated 2500-lbf minimum tension.

E. Pulling-In and Lifting Irons in Concrete Floors: 7/8-inch-diameter, hot-dip galvanized, bent steel rod; stress relieved after forming; and fastened to reinforcing rod. Exposed triangular opening.
1. Ultimate Yield Strength: 40,000-lbf shear and 60,000-lbf tension.

F. Bolting Inserts for Concrete Utility Structure Cable Racks and Other Attachments: Flared, threaded inserts of noncorrosive, chemical-resistant, nonconductive thermoplastic material; 1/2-inch ID by 2-3/4 inches deep, flared to 1-1/4 inches minimum at base.
1. Tested Ultimate Pullout Strength: 12,000 lbf minimum.

G. Expansion Anchors for Installation after Concrete Is Cast: Zinc-plated, carbon-steel-wedge type with stainless-steel expander clip with 1/2-inch bolt, 5300-lbf rated pullout strength, and minimum 6800-lbf rated shear strength.

H. Cable Rack Assembly: Steel, hot-dip galvanized, except insulators.
1. Stanchions: T-section or channel; 2-1/4-inch nominal size; punched with 14 holes on 1-1/2-inch centers for cable-arm attachment.
2. Arms: 1-1/2 inches wide, lengths ranging from 3 inches with 450-lb minimum capacity to 18 inches with 250-lb minimum capacity. Arms shall have slots along full length for cable ties and be arranged for secure mounting in horizontal position at any vertical location on stanchions.

I. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35°F. Capable of withstanding temperature of 300°F without slump and adhering to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.

PART 3 - EXECUTION

3.01 EARTHWORK

A. Excavation and Backfill: Comply with Section 31 20 00 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restore surface features at areas disturbed by excavation and reestablish original grades, unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding,
sodding, sprigging, and mulching. Comply with Section 32 92 00 "Turf and Grasses" and Section 32 93 00 "Plants."

D. Cut and patch existing pavement in the path of underground ducts and utility structures according to Section 01 73 29 "Cutting and Patching."

3.02 DUCT INSTALLATION

A. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes to drain in both directions.

B. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches, both horizontally and vertically, at other locations, unless otherwise indicated.

C. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.

D. Duct Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches o.c. for 5-inch ducts, and vary proportionately for other duct sizes.
   1. Begin change from regular spacing to end-bell spacing 10 feet from the end bell without reducing duct line slope and without forming a trap in the line.
   2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole.
   3. Grout end bells into structure walls from both sides to provide watertight entrances.

E. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet outside the building wall without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls as specified in Section 26 05 44 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

F. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.

G. Pulling Cord: Install 100-lbf- test nylon cord in ducts, including spares.

H. Provide one spare 4” conduit along primary route and encase entire primary duct bank in concrete.

I. Concrete-Encased Ducts: Support ducts on duct separators.
   1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than 5 spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches between tiers. Tie entire assembly together
using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.

2. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.
   a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations, or use other specific measures to prevent expansion-contraction damage.
   b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing rod dowels extending 18 inches into concrete on both sides of joint near corners of envelope.

3. Pouring Concrete: Spade concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Use a plank to direct concrete down sides of bank assembly to trench bottom. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.

4. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.

5. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.

6. Minimum Space between Ducts: 3 inches between ducts and exterior envelope wall, 2 inches between ducts for like services, and 4 inches between power and signal ducts.

7. Depth: Install top of duct bank at least 24 inches below finished grade in areas not subject to deliberate traffic, and at least 30 inches below finished grade in deliberate traffic paths for vehicles, unless otherwise indicated.

8. Stub-Ups: Use manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Extend concrete encasement throughout the length of the elbow.

9. Stub-Ups: Use manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.
   a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
   b. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.

10. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of the centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

3.03 INSTALLATION OF TRANSFORMER PAD/VAULT

A. Comply with ASTM C 891, unless otherwise indicated.
B. Install units level and plumb and with orientation and depth coordinated with
counting ducts to minimize bends and deflections required for proper entrances.

C. Unless otherwise indicated, support units on a level bed of crushed stone or gravel,
graded from 1-inch sieve to No. 4 sieve and compacted to same density as adjacent
undisturbed earth.

D. Hardware: Install removable hardware, including pulling eyes, cable stanchions, cable
arms, and insulators, as required for installation and support of cables and conductors
and as indicated.

E. Field-Installed Bolting Anchors: Do not drill deeper than 3-7/8 inches for anchor bolts
installed in the field. Use a minimum of two anchors for each cable stanchion.

3.04 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST
CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth
coordinated with connecting ducts to minimize bends and deflections required for
proper entrances. Use box extension if required to match depths of ducts, and seal
joint between box and extension as recommended by the manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel,
graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent
undisturbed earth.

C. Elevation: In paved areas and trafficways, set so cover surface will be flush with
finished grade. Set covers of other handholes 1 inch above finished grade.

D. Install handholes and boxes with bottom below the frost line.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and
insulators, as required for installation and support of cables and conductors and as
indicated. Select arm lengths to be long enough to provide spare space for future
cables, but short enough to preserve adequate working clearances in the enclosure.

F. Field-cut openings for ducts and conduits according to enclosure manufacturer's
written instructions. Cut wall of enclosure with a tool designed for material to be cut.
Size holes for terminating fittings to be used, and seal around penetrations after fittings
are installed.

3.05 GROUNDING

A. Ground underground ducts and utility structures according to Section 26 05 26
"Grounding and Bonding for Electrical Systems."

3.06 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:
1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.

2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.

3. Test Transformer Pad grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 26 05 26 "Grounding and Bonding for Electrical Systems."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

C. Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

1. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

2. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet (46 m) or less of trench length, but no fewer than two tests.

3. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.07 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION
SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
   2. Sleeve-seal systems.
   5. Silicone sealants.

B. Related Requirements:
   1. Section 07 84 13 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:
   1. Product Data for Credit EQ 4.1: For sealants, documentation including printed statement of VOC content.
   2. Laboratory Test Reports for Credit EQ 4: For sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 2 - PRODUCTS

2.01 SLEEVES

A. Wall Sleeves:
   2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
   Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. Sleeves for Rectangular Openings:
   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.

2.02 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Advance Products & Systems, Inc.
      b. CALPICO, Inc.
      c. Metraflex Company (The).
      d. Pipeline Seal and Insulator, Inc.
      e. Proco Products, Inc.
   2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
   3. Pressure Plates: Stainless steel.
   4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.03 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Presealed Systems.

2.04 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
   C. Design Mix: 5000-psi, 28-day compressive strength.
   D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.01 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 or unless seismic criteria require different clearance.
   4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
   1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
   2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using [steel] [cast-iron] pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.02 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.

3.03 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION
SECTION 26 0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Identification for conductors.
   2. Underground-line warning tape.
   3. Instruction signs.
   4. Equipment identification labels.
   5. Miscellaneous identification products.

1.03 QUALITY ASSURANCE

A. Comply with ANSI A13.1.
B. Comply with NFPA 70.
D. Comply with ANSI Z535.4 for safety signs and labels.
E. Comply with all MSU standards.
F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.04 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
C. Coordinate installation of identifying devices with location of access panels and doors.
D. Install identifying devices before installing acoustical ceilings and similar concealment.
PART 2 - PRODUCTS

2.01 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

2.02 UNDERGROUND-LINE WARNING TAPE

A. Tape:
1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:
1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

C. Type:
1. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.
2. Overall Thickness: 5 mils.
3. Foil Core Thickness: 0.35 mil.
5. 3-Inch Tensile According to ASTM D 882: 70 lbf, and 4600 psi.

2.03 WARNING LABELS AND SIGNS


B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Warning label and sign shall include, but are not limited to, the following legends:
1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."
2.04 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
   1. Engraved legend with black letters on white face.
   2. Punched or drilled for mechanical fasteners.
   3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.05 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 1/2 inch.

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 1/2 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 1/2 inch.

D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 1/2 inch.

2.06 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
   2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
   3. Temperature Range: Minus 40 to plus 185 deg F.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.
   2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
   3. Temperature Range: Minus 40 to plus 185 deg F.

C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
   2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
   3. UL 94 Flame Rating: 94V-0.
   4. Temperature Range: Minus 50 to plus 284 deg F.
   5. Color: Black.
2.07 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
   1. Outdoors: UV-stabilized nylon.
   2. In Spaces Handling Environmental Air: Plenum rated.

G. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.

H. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.02 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with paint as follows:
   1. Fire Detection and Alarm System: Red

B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
   1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
      a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:
   1) Phase A: Black.
   2) Phase B: Red.
   3) Phase C: Blue.
   4) Neutral: White.

c. Colors for 480/277-V Circuits:
   1) Phase A: Brown.
   2) Phase B: Orange.
   3) Phase C: Yellow.
   4) Neutral: Gray.

d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

C. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

D. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive vinyl labels with the conductor or cable designation, origin, and destination.

E. Control-Circuit Conductor Termination Identification: For identification at terminations provide self-adhesive vinyl labels with the conductor designation.

F. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.

   1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
   2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

H. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
   1. Install underground-line warning tape for both direct-buried cables and cables in raceway.

I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
   2. Identify system voltage with black letters on an orange background.
   3. Apply to exterior of door, cover, or other access.
   4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
      a. Power transfer switches.
b. Controls with external control power connections.

J. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer and load shedding.

L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:
   a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
   b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
   c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
   d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:
   a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved, laminated acrylic or melamine label. Panelboard identification shall include: Identification name, voltage, source and available fault current with date calculated.
      1) On main distribution panel door provide a laminated one-line diagram of panel configurations.
   b. Enclosures and electrical cabinets.
   c. Access doors and panels for concealed electrical items.
   d. Switchgear.
   e. Switchboards.
   f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
   g. Substations.
   h. Emergency system boxes and enclosures.
   i. Motor-control centers.
   j. Enclosed switches.
   k. Enclosed circuit breakers.
   l. Enclosed controllers.
   m. Variable-speed controllers.
   n. Push-button stations.
o. Power transfer equipment.
p. Contactors.
q. Remote-controlled switches, dimmer modules, and control devices.
r. Battery-inverter units.
s. Battery racks.
t. Power-generating units.
u. Monitoring and control equipment.
v. UPS equipment.
w. Wiring devices: See specification section “Wiring Devices”.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes the following types of transformers with medium-voltage primaries:
   1. Pad-mounted, liquid-filled transformers.

1.02 ACTION SUBMITTALS

A. Product Data: For each type and size of transformer indicated.

B. Shop Drawings: Diagrams including power control wiring.

1.03 INFORMATIONAL SUBMITTALS

A. Manufacturer Seismic Qualification Certification: Submit certification that transformers, accessories, and components will withstand seismic forces defined in Section 26 0548 "Vibration and Seismic Controls for Electrical Systems."

B. Instruction Manuals, Test Reports, and Parts List: Seller shall furnish complete instruction manuals covering installation, operation and maintenance for all equipment. Manuals, bound in binders provided by the owner and properly labeled to indicate the equipment covered, shall include:
   1. Certified outline assembly and installation drawings, certified foundation drawings, and complete nameplate data for each item.
   2. Specific equipment instruction books.
   3. Renewal parts lists for all replaceable parts and assemblies. Furnish (5) copies at least (2) weeks prior to shipment.

1.04 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.05 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with IEEE C2 and NFPA 70.


1.06 PROJECT CONDITIONS

A. Service Conditions: IEEE C37.121, usual service conditions.
PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Acme Electric Corporation; Power Distribution Products Division.
   2. Cooper Industries; Cooper Power Systems Division.
   4. GE Electrical Distribution & Control.
   5. Hammond Manufacturing; Transformer Group.
   6. Pioneer Transformers Ltd.
   7. Siemens Energy & Automation, Inc.
   8. Square D/Groupe Schneider NA.

2.02 PAD-MOUNTED, LIQUID-FILLED TRANSFORMERS


B. Windings: COPPER.

C. Insulating Liquid: Mineral oil, ASTM D 3487, Type II, tested according to ASTM D 117.

D. Insulating Liquid: Less flammable, edible-seed-oil based, and listed by a NRTL acceptable to authority having jurisdiction as complying with NFPA 70 requirements for fire point of not less than 300 deg C when tested according to ASTM D 92. Liquid shall be biodegradable and nontoxic.

E. Insulation Temperature Rise: 55 deg C when operated at rated kVA output in a 40 deg C ambient temperature.

F. Basic Impulse Level: 95 kV.

G. Primary voltage rating: 12470 Grd. Y/7200 volts.

H. Secondary voltage: 480Y/277 volts.

I. Full-Capacity Voltage Taps: Four, 2.5 percent taps, 2 above and 2 below rated high voltage; with externally operable, de-energized, tap changer; position indicator; and padlock hasp.

J. High-Voltage Switch: 200 A, make-and-latch rating of 10-kA RMS, symmetrical, arranged for loop feed with 4-position, gang-operated, load-break switch, oil immersed in transformer tank with hook-stick operating handle in primary compartment.
   1. Four positions sectionalizing switches as described below shall be provided.
a. Switches shall be integral, oil immersed, rotary, gang operated, rated for load break operation, T-Blade design with make-before-break option.
b. Switches shall rotate full 3600 without a physical stop. Movable index plate shall be provided that will limit accidental switch rotation.
c. Switch operating handles shall be permanently attached, hook stick operable, and clearly marked for switch position and circuit identification.
d. One line electrical diagrams of switch arrangements shall be mounted in clear view when transformer access doors are opened. Phase identification shall be clearly marked.
e. Primary switches shall be rated 200 amp min. continuous current.
f. The switch positions and required sequences are defined below. Position 1 at 12:00 and rotation listed is clockwise.
   1) Position
      a) Source A and B connected to transformer winding.
      b) Source B connected to transformer winding.
      c) Source A connected to B, transformer winding disconnected.
      d) Source A connected to transformer winding.

   Note: Load break bayonet fuse devices shall not be considered as providing a switching function.

K. Primary Fuses: 150-kV fuse assembly with fuses complying with IEEE C37.47. Rating of current-limiting fuses shall be 50-kA RMS at specified system voltage.

L. Surge Arresters: Distribution class, one for each primary phase; complying with IEEE C62.11 and NEMA LA 1. Transformers shall have six arresters for loop-feed circuits.

M. High-Voltage Terminations and Equipment: Dead front with universal-type bushing wells for dead-front bushing-well inserts, complying with IEEE 386 and including the following:
   1. Bushing-Well Inserts: One for each high-voltage bushing well.
   2. Surge Arresters: Dead-front, elbow-type, metal-oxide-varistor units.
   3. Parking Stands: One for each high-voltage bushing well.
   4. Portable Insulated Bushings: Arranged for parking insulated, high-voltage, load-break cable terminators; one for each primary feeder conductor terminating at transformer.

N. Secondary Terminations: NEMA standard spade bushing, per ANSI C57.12.26 shall be provided for transformer secondary terminations.

O. A minimum of four, welded, ground lug attachment points shall be provided for concentric neutral termination on lower front of transformer tank. Ground lugs shall accommodate 1/0 str. cu. Ground conductor.

P. Accessories:
   1. Drain Valve: 1 inch, with sampling device.
2. Dial-type thermometer.
3. Liquid-level gage.
4. Pressure-vacuum gage.
5. Pressure Relief Device: Self-sealing with an indicator.
7. Busway terminal connection at low-voltage compartment.

2.03 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each transformer, mounted with corrosion-resistant screws.

B. Caution Sign: Provide 7” x 10” caution warning signs on exterior of all access doors.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install and anchor transformers on concrete vault according to manufacturer’s written instructions, MSU standards, and according to seismic codes applicable to Project.
   1. Construct concrete bases of dimensions indicated on drawings.
   2. Use 4000-psi, 28-day compressive-strength concrete and reinforcement as specified in Section 03 3000 "Cast-in-Place Concrete."
   3. Slump range 2 inches to 4 inches.
   4. Air content shall be 5 percent by volume.
   5. Install dowel rods to connect concrete bases to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
   6. Anchor equipment with epoxy-embedded anchor bolts that extend through concrete base and anchor into structural concrete floor.

B. Maintain minimum clearances according to manufacturer’s written instructions and NFPA 70.

3.02 IDENTIFICATION

A. Identify components and provide warning signs as specified in Section 26 0553 "Identification for Electrical Systems."

3.03 FIELD QUALITY CONTROL

A. Perform electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.2. Certify compliance with test parameters.

B. Test and adjust controls and safeties.

C. Equipment Guarantee: Without limiting any other provision regarding guarantees, manufacturer shall guarantee the equipment as follows: Seller shall guarantee to the Owner that the equipment together with all parts included in the original purchase, is free of defect in workmanship and materials and is capable of continuous and satisfactory performance when operated in accordance with the instructions provided by the Seller at the specified rating and capacity. Guarantee shall extend for a
minimum of one (1) year from the date of commercial operation. It shall cover all defects and malfunctions of the equipment and accessories.

3.04 FOLLOW-UP SERVICE

A. Voltage Monitoring and Adjusting: Perform the following voltage monitoring after Substantial Completion but not more than six months after Final Acceptance:

1. During a period of normal load cycles, perform seven days of continuous three-phase voltage recording at secondary terminals of each transformer. Voltage unbalance greater than 1 percent between phases, or deviation of any phase voltage from nominal value by more than plus or minus 5 percent during test period, is unacceptable.

2. Corrective Actions: If test results are unacceptable, perform the following corrective actions, as appropriate:
   a. Adjust transformer taps.
   b. Prepare written request for voltage adjustment by MSU.

3. Retests: After corrective actions have been performed, repeat monitoring until satisfactory results are obtained.


END OF SECTION
SECTION 26 5600 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Exterior luminaires with lamps and ballasts.
   2. Luminaire-mounted photoelectric relays.
   3. Poles and accessories.

1.02 ACTION SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, and finishes.

1.03 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.


   C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide product indicated on Drawings.

2.02 GENERAL REQUIREMENTS FOR LUMINAIRES

A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

   1. LER Tests Incandescent Fixtures: Where LER is specified, test according to NEMA LE 5A.

   2. LER Tests HID Fixtures: Where LER is specified, test according to NEMA LE 5B.

B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.
E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.

G. Exposed Hardware Material: Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

J. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:
   1. White Surfaces: 85 percent.
   2. Specular Surfaces: 83 percent.
   3. Diffusing Specular Surfaces: 75 percent.

K. Lenses and Refractors Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

L. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

M. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
   2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
      a. Color: As selected from manufacturer's standard catalog of colors.
      c. Color: As selected by Architect from manufacturer's full range.

N. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20; and seal aluminum surfaces with clear, hard-coat wax.

3. Class I, Clear Anodic Finish: AA-M32C22A41 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

4. Class I, Color Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: medium satin; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.
   a. Color: Dark bronze.

O. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
   1. Label shall include the following lamp and ballast characteristics:
      a. "USES ONLY" and include specific lamp type.
      b. Lamp tube configuration (twin, quad, triple), base type, and nominal wattage for compact fluorescent luminaires.
      c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
      d. Start type (preheat, rapid start, instant start) compact fluorescent luminaires.
      e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
      f. CCT and CRI for all luminaires.

2.03 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

A. Comply with UL 773 or UL 773A.

B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc and off at 4.5 to 10 fc with 15-second minimum time delay
   1. Relay with locking-type receptacle shall comply with ANSI C136.10.
   2. Adjustable window slide for adjusting on-off set points.

2.04 BALLASTS/DRivers AND LAMPS

A. Ballasts for Low-Temperature Environments:
   1. Temperatures 0 Deg F and Higher: Electronic type rated for 0 deg F starting and operating temperature with indicated lamp types.
   2. Temperatures Minus 20 Deg F and Higher: Electromagnetic type designed for use with indicated lamp types.

B. Ballast Characteristics:
   1. Power Factor: 90 percent, minimum.
   2. Sound Rating: Class A.
   3. Total Harmonic Distortion Rating: Less than 10 percent.
6. Transient-Voltage Protection: Comply with IEEE C62.41.1 and IEEE C62.41.2, Category A or better.

C. Low-Temperature Lamp Capability: Rated for reliable starting and operation with ballast provided at temperatures 0 deg F and higher.

D. All exterior lamps shall have a color temperature of 3500-3700K.

2.05 GENERAL REQUIREMENTS FOR POLES AND SUPPORT COMPONENTS

A. Structural Characteristics: Comply with AASHTO LTS-4-M.
   1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in "Structural Analysis Criteria for Pole Selection" Article.
   2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts unless otherwise indicated.

C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
   1. Materials: Shall not cause galvanic action at contact points.
   3. Anchor-Bolt Template: Plywood or steel.

D. Power-Installed Screw Foundations: Factory fabricated by pole manufacturer, with structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123M; and with top-plate and mounting bolts to match pole base flange and strength required to support pole, luminaire, and accessories.

PART 3 - EXECUTION

3.01 LUMINAIRE INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports.
   1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Adjust luminaires that require field adjustment or aiming.

3.02 POLE INSTALLATION

A. Alignment: Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.
B. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on Drawings:
   1. Fire Hydrants and Storm Drainage Piping: 60 inches.
   3. Trees: 15 feet from tree trunk.

C. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer. Concrete materials, installation, and finishing requirements are specified in Section 03 3000 "Cast-in-Place Concrete."

D. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.
   1. Use anchor bolts and nuts selected to resist seismic forces defined for the application and approved by manufacturer.
   2. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
   3. Install base covers unless otherwise indicated.
   4. Use a short piece of 1/2-inch- diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

E. Embedded Poles with Tamped Earth Backfill: Set poles to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.
   1. Dig holes large enough to permit use of tampers in the full depth of hole.
   2. Backfill in 6-inch layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of undisturbed earth.

F. Embedded Poles with Concrete Backfill: Set poles in augered holes to depth below finished grade indicated on Drawings, but not less than one-sixth of pole height.
   1. Make holes 6 inches in diameter larger than pole diameter.
   2. Fill augered hole around pole with air-entrained concrete having a minimum compressive strength of 3000 psi at 28 days, and finish in a dome above finished grade.
   3. Use a short piece of 1/2-inch- diameter pipe to make a drain hole through concrete dome. Arrange to drain condensation from interior of pole.
   4. Cure concrete a minimum of 72 hours before performing work on pole.

G. Poles and Pole Foundations Set in Concrete Paved Areas: Install poles with minimum of 6-inch- wide, unpaved gap between the pole or pole foundation and the edge of adjacent concrete slab. Fill unpaved ring with pea gravel to a level 1 inch below top of concrete slab.

H. Raise and set poles using web fabric slings (not chain or cable).

3.03 BOLLARD LUMINAIRE INSTALLATION

A. Align units for optimum directional alignment of light distribution.

B. Install on concrete base with top 4 inches above finished grade or surface at bollard location. Cast conduit into base, and shape base to match shape of bollard base. Finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 03 3000 "Cast-in-Place Concrete."
3.04 INSTALLATION OF INDIVIDUAL GROUND-MOUNTING LUMINAIRES

A. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit into base, and finish by troweling and rubbing smooth. Concrete materials, installation, and finishing are specified in Section 03 3000 "Cast-in-Place Concrete."

3.05 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 26 0533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch-thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.06 GROUNDING

A. Ground metal poles and support structures according to Section 26 0526 "Grounding and Bonding for Electrical Systems."
   1. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

B. Ground nonmetallic poles and support structures according to Section 26 0526 "Grounding and Bonding for Electrical Systems."
   1. Install grounding conductor and conductor protector.
   2. Ground metallic components of pole accessories and foundations.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pathways.
   2. Inter-Building Feed.
   3. UTP cable.
   4. Cable connecting hardware, patch panels, and cross-connects.
   5. Cabling identification products.

B. Related Sections:
   1. Section 271500 "Communications Horizontal Cabling".

1.2 BACKBONE CABLING DESCRIPTION

A. Backbone cabling system shall provide interconnections between communications equipment rooms, main terminal space, and entrance facilities in the telecommunications cabling system structure. Cabling system consists of backbone cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for backbone-to-backbone cross-connection.

B. Inter-Building Feed: Telephone & fiber backbone cabling will originate from the Renne Library basement. The telephone cable is to be a CMR rated ARRM-type shielded riser cable, with a fire retardant PVC jacket. For fiber cabling, Corning brand cable is required. Both telephone and fiber shall be routed entirely in the campus tunnel system.

C. Backbone cabling cross-connects may be located in communications equipment rooms or at entrance facilities. Bridged taps and splitters shall not be used as part of backbone cabling.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Backbone cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.

B. MSU Standards: Backbone cabling system shall comply with all MSU ITC & Aux IT standards.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings:

1. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.

2. Cabling administration drawings and printouts.

3. Wiring diagrams to show typical wiring schematics including the following:
   b. Patch panels.
   c. Patch cords.

4. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.

5. Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.

B. Source quality-control reports.

C. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance data.

B. Record Drawings: As-built drawings shall be provided and at minimum shall show cable routes, telecommunication room and outlet locations. Drawings will be given to Facilities Services for entry onto their CADD system.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

   1. Layout Responsibility: Preparation of Shop Drawings and Cabling Administration Drawings by an RCDD.

   2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.


1.8 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site. Test each pair of UTP cable for open and short circuits.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, and D-rings.
3. Straps and other devices.

B. Cable Trays:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
   a. Cable Management Solutions, Inc.
   b. Cablofil Inc.
   c. Cooper B-Line, Inc.
   d. Cope - Tyco/Allied Tube & Conduit.
   e. GS Metals Corp.

2. Cable Tray Material: Metal, suitable for indoors, and protected against corrosion by electroplated zinc galvanizing, complying with ASTM B 633, Type 1, not less than 0.000472 inches (0.012 mm) thick
   a. Basket Cable Trays: 6 inches (150 mm) wide and 2 inches (50 mm) deep Wire mesh spacing shall not exceed 2 by 4 inches (50 by 100 mm).
b.  Ladder Cable Trays: Nominally 18 inches (455 mm) wide, and a rung spacing of 12 inches (305 mm).

C.  Conduit and Boxes: Comply with requirements in Section 260533 "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.

1.  Outlet boxes shall be no smaller than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.

2.2  BACKBOARDS

A.  Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 48 inches (19 by 1220 by 1220 mm). Comply with requirements in Section 061000 "Rough Carpentry" for plywood backing panels.

2.3  UTP CABLE

A.  Manufacturers: Subject to compliance with requirements, provide products by the following:

1.  Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B.  Models: The following are the part numbers to be used for Category 6, four pair UTP cable:

1.  TE Non-plenum Category 6 cable – gray:  TE620R-GYRB
2.  TE Plenum Category 6 cable – gray:  TE620P-GYRB

C.  Description:  100-ohm, 100-pair UTP, formed into 25-pair binder groups covered with a gray thermoplastic jacket and overall metallic shield.

1.  Comply with ICEA S-90-661 for mechanical properties.
2.  Comply with TIA/EIA-568-B.1 for performance specifications.
4.  Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

a.  Communications, General Purpose:  Type CM or CMG; or MPP, CMP, MPR, CMR, MP, or MPG.

b.  Communications, Plenum Rated:  Type CMP or MPP, complying with NFPA 262.

c.  Communications, Riser Rated:  Type CMR; or MPP, CMP, or MPR, complying with UL 1666.

D.  Communications, Limited Purpose:  Type CMX; or MPP, CMP, MPR, CMR, MP, MPG, CM, or CMG.

e.  Multipurpose:  Type MP or MPG; or MPP or MPR.
f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.

g. Multipurpose, Riser Rated: Type MPR or MPP, complying with UL 1666.

2.4 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

C. Connecting Blocks: [110-style IDC for Category 5e] Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.

1. Number of Terminals per Field: One for each conductor in assigned cables.

E. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.

1. Number of Jacks per Field: One for each four-pair UTP cable indicated

2. Telephone Patch Panel: Provide TE 24 Port 557403-1

F. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.

G. Patch Cords: Factory-made, 4-pair cables in 36-inch (900-mm) lengths; terminated with 8-position modular plug at each end.

1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.

2. Patch cords shall have color-coded boots for circuit identification.

2.5 FIBER OPTIC CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Corning
B. Terminations: Provide termination by fusion splices.

C. Accessories: Coordinate preferred connectors with MSU ITC prior to install.

2.6 GROUNDING

A. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

B. Comply with ANSI-J-STD-607-A.

2.7 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.8 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test cables on reels according to TIA/EIA-568-B.1.

C. Factory test UTP cables according to TIA/EIA-568-B.2.

D. Cable will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 ENTRANCE FACILITIES

A. Coordinate with MSU ITC and Aux IT for all terminations within Renne Library. Coordinate backbone cabling with the protectors and demarcation point provided by communications service provider.

3.2 WIRING METHODS

A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and attics. Conceal raceway and cables except in unfinished spaces.

1. Install plenum cable in environmental air spaces, including plenum ceilings.

2. Comply with requirements for raceways and boxes specified in Section 260533 "Raceway and Boxes for Electrical Systems."

B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.
3.3 INSTALLATION OF PATHWAYS

A. **Cable Trays:** Comply with NEMA VE 2 and TIA/EIA-569-A.

B. **Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Section 271100 "Communications Equipment Room Fittings." Drawings indicate general arrangement of pathways and fittings.**

C. **Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.**

D. **Comply with requirements in Section 260533 "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.**

E. **Install manufactured conduit sweeps and long-radius elbows whenever possible.**

F. **Pathway Installation in Communications Equipment Rooms:**
   1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
   2. Install cable trays to route cables if conduits cannot be located in these positions.
   3. Secure conduits to backboard when entering room from overhead.
   4. Extend conduits 3 inches (76 mm) above finished floor.
   5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

G. **Backboards:** Install backboards with 96-inch (2440-mm) dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.4 INSTALLATION OF CABLES

A. **Comply with NECA 1.**

B. **General Requirements for Cabling:**
   2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices".
   3. Install 110-style IDC termination hardware unless otherwise indicated.
   4. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
   5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.

7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.

8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.

9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.

10. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.

11. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:


2. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.

D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.

2. Suspend UTP cable not in a wireway or pathway, a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 60 inches (1524 mm) apart.

3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.

2. Install cabling after the flooring system has been installed in raised floor areas.

3. Coil cable 6 feet (1800 mm) long not less than 12 inches (300 mm) in diameter below each feed point.

F. Group connecting hardware for cables into separate logical fields.
G. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.

2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches (127 mm).
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches (300 mm).
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches (610 mm).

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
   a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches (64 mm).
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches (150 mm).
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches (300 mm).

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
   b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (76 mm).
   c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).

5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).

6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.5 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."
B. Comply with TIA/EIA-569-A, Annex A, "Firestopping."
C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.6 GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
B. Comply with ANSI-J-STD-607-A.
C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.7 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
   1. Administration Class: [1].
   2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
B. Comply with requirements in Section 099123 "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
C. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 1 level of administration including optional identification requirements of this standard.
D. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
E. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.
F. Cable and Wire Identification: Confirm exact scheme with MSU IT prior to install.
   1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.

3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).

4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
   a. Individually number wiring conductors connected to terminal strips and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device with name and number of particular device as shown.
   b. Label each unit and field within distribution racks and frames.

5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

G. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA 606-A, for the following:
   1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.8 FIELD QUALITY CONTROL

A. Tests and Inspections: Coordinate all testing with MSU ITC and Aux IT.
   2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
   3. Test UTP copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
      a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

B. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM,
or transferred from the instrument to the computer, saved as text files, and printed and submitted to MSU.

C. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

D. Prepare test and inspection reports for MSU.

END OF SECTION
SECTION 31 1000
SITE CLEARING

PART 1 GENERAL
1.01 SECTION INCLUDES
   A. Clearing and protection of vegetation.
   B. Removal of existing debris.

1.02 RELATED REQUIREMENTS
   A. Section 01 5713 - Temporary Erosion and Sediment Control.
   B. Section 01 7419 - Waste Management for requirements on recycling existing asphalt and concrete.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION
3.01 SITE CLEARING
   A. Comply with other requirements specified in Section 01 7000.
   B. All existing site asphalt and concrete must be recycled.

3.02 EXISTING UTILITIES AND BUILT ELEMENTS
   A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
   B. Protect existing utilities to remain from damage.
   C. Do not disrupt public utilities without permit from authority having jurisdiction.
   D. Protect existing structures and other elements that are not to be removed.

3.03 VEGETATION
   A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, playing fields, lawns, and planting beds.
   B. Do not remove or damage vegetation beyond the limits indicated on drawings.
      1. 40 feet outside the building perimeter.
      2. 10 feet each side of surface walkways, patios, surface parking, and utility lines less than 12 inches in diameter.
      3. 15 feet each side of roadway curbs and main utility trenches.
      4. 25 feet outside perimeter of pervious paving areas that must not be compacted by construction traffic.
   C. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
      1. At vegetation removal limits.
   D. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.
   E. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
      1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
      2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
   F. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to MSU Facilities.

3.04 DEBRIS
   A. Remove debris, junk, and trash from site.
B. Leave site in clean condition, ready for subsequent work.
C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Preparing subgrades for slabs-on-grade and planting areas.
   B. Excavating and backfilling for buildings and structure.
   C. Drainage course for concrete slab-on-grades.

1.02 RELATED REQUIREMENTS
   A. Section 31 2310 - Pipe Trench Excavation and Backfill.
   B. Section 31 2320 - Street Excavation and Backfill.
   C. Standard Specifications - Earth Moving for Site Work:
      1. Earth moving for site work consists of all earth moving except that directly associated with
         excavation and structural backfill around buildings, walls and other structures. For all site
         work, the Standard Specifications consist of the Montana Public Works Standard
         Specifications, sixth edition (MPWSS), as amended by City of Bozeman Modifications to
         MPWSS, latest edition.
      2. Except as specifically noted otherwise in the contract documents, all site work shall be
         performed in accordance with the Standard Specifications.
      3. The information in these project specifications shall take precedence in the event of any
         discrepancies. Any discrepancies discovered by the Contractor shall be brought to the
         attention of the Engineer before performing the associated work.

1.03 DEFINITIONS
   A. Backfill: Soil material used to fill an excavation.
   B. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward
      capillary flow of pore water.
   C. Excavation: Removal of material encountered above subgrade elevations and to lines and
      dimensions indicated:
      1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond
         indicated lines and dimensions as directed by Architect. Authorized additional excavation
         and and replacement material will be paid for according to Contract provisions for changes
         in work.
      2. Unauthorized Excavations: Excavation below subgrade elevations or beyond indicated
         lines and dimensions without direction by Architect. Unauthorized excavation, as well as
         remedial work directed by Architect, shall be without additional compensation.
   D. Fill: Soil materials used to raise existing grades.
   E. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and
      electrical appurtenances, or other man-made stationary features constructed above or below
      the ground surface.
   F. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately
      below subbase, drainage fill, drainage fill, drainage course, or topsoil material.

1.04 QUALITY ASSURANCE
   A. Pre-Excavation Conference: Conduct conference at project site.

1.05 PROJECT CONDITIONS
   A. Do not commence earth moving operations until plant-protection measures specified in Division
      01 Section "Temporary Tree and Plant Protection" are in place.
   B. Do not commence earth moving operations until plant-protection measures specified in Section
      015639 "Temporary Tree and Plant Protection" are in place.
PART 2 PRODUCTS

2.01 SOIL MATERIAL
A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
B. Satisfactory Soils: Soil clarification Group GW, GP, GM, SW, SP and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, or other deleterious matter.
C. Unsatisfactory Materials: Soil Clarification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
   1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
D. Structural Fill: Material and gradation as indicated in the Drawings.
E. Drainage Gravel: Material and gradation as indicated in the Drawings.

PART 3 EXECUTION

3.01 PREPARATION
A. Protect structures, utilities, sidewalks, pavement, and other facilities from damage caused by settlement lateral movement, undermining, washout, and other hazards created by earth moving operations.
B. Protect and maintain erosion and sedimentation controls during earth moving operations.
C. Protect subgrades and foundation soil from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.02 EXCAVATION, GENERAL
A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
   1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.03 EXCAVATION FOR STRUCTURES
A. Excavate to indicated elevations and dimensions within the tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
   1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Trim bottoms to required lines and grades to leave solid base to receive other work.
B. Excavations at edges of Tree and Plant Protection Zones:
   1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears or pulls roots.
   2. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."
C. Proof-roll subgrade below the building slabs with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.04 SUBGRADE INSPECTION
A. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.05 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.
   1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe and conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
   1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipe and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones for sharp objects along trench subgrade.
   1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
   2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe and conduit circumference. Fill depressions with tamped sand backfill.
   3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
   4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
   1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

E. Trenches in Tree-and-Plant Protection Zones:
   1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spreading forks or comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pull roots.
   2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
   3. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection".

3.06 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under footings or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28 day compressive strength of 2500 psi, may be used when approved by the Architect.
   1. Fill unauthorized excavations under other construction pipe, or conduit as directed by Architect.

3.07 STORAGE OF SOIL MATERIAL

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

B. Place and compact fill material in layers to required elevations as follows:
   1. Under building slabs, use engineered fill.
3.08 **SOIL FILL**
A. Plow, scarpify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
B. Place and compact fill material in layers to required elevations as follows:
   1. Under grass and planted areas, use unsatisfactory soil material and topsoil
   2. Under walks and pavements, use satisfactory soil material
   3. Under steps and ramps, use engineered fill
   4. Under building slabs, use engineered fill
   5. Under footings and foundations, use engineered fill

3.09 **SOIL MOISTURE CONTROL**
A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
   1. Do not backfill or fill soil material on surfaces that are muddy, frozen, or contain ice or frost.
   2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimal moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.10 **COMPACATION OF SOIL BACKFILLS AND FILLS**
A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698.
   1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 98 percent.
   2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
   3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.

3.11 **GRADING**
A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
B. Site Rough Grading: Slope grades to direct water away from buildings and prevent ponding.
   1. Turf or Unpaved Area: Elevation of prepared subgrade shall allow for 6 inch depth of imported topsoil before compaction to achieve finish grade.
C. Grading Inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.12 **DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE**
A. Place drainage course on subgrades free of mud, frost, snow, or ice.
B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
   1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
   2. Compact each layer of drainage course to required cross sections and thickness to not less than 98 percent of maximum dry unit weight according to ASTM D 698.
3.13 FIELD QUALITY CONTROL
   A. Testing Agency: Contractor will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
   B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
   C. When testing agency reports that subgrades, fills, or backfill have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil material to depth required; recompact and retest until specified compaction is obtained.

3.14 PROTECTION
   A. Protecting Graded Area: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
   B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
   C. Where settling occurs before project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct possible.
      1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.15 DISPOSAL OF SURPLUS AND WASTE MATERIALS
   A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off owner's property.

END OF SECTION
PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Excavating for building volume below grade, footings, slabs-on-grade, paving, and utilities within the building.
   B. Trenching for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS
   A. See Geotechnical report; bore hole locations and findings of subsurface materials.
   B. Section 01 7000 - Execution and Closeout Requirements: General requirements for dewatering of excavations and water control.
   C. Section 31 2323 - Fill: Fill materials, filling, and compacting.

1.03 UNIT PRICES
   A. See Section 01 2200 - Unit Prices, for general requirements applicable to unit prices for excavation.
   B. Unit Price UP-1: Excavating Soil Materials:
      1. Measurement method: By the cubic foot.
      2. Includes: Excavating to required elevations, loading and placing materials in stockpile.
      3. Does Not Include Over-Excavation: Payment will not be made for over-excavated work nor for replacement materials.

1.04 PROJECT CONDITIONS
   A. Verify that survey bench mark and intended elevations for the Work are as indicated.
   B. Protect bench marks, survey control points, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PREPARATION
   A. Identify required lines, levels, contours, and datum locations.
   B. Locate, identify, and protect utilities that remain and protect from damage.

3.02 EXCAVATING
   A. Excavate to accommodate new structures and construction operations.
   B. Notify Mosaic Architecture of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
   C. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.
   D. Do not interfere with 45 degree bearing splay of foundations.
   E. Cut utility trenches wide enough to allow inspection of installed utilities.
   F. Hand trim excavations. Remove loose matter.
   G. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 2323.
   H. Grade top perimeter of excavation to prevent surface water from draining into excavation.
   I. Remove excavated material that is unsuitable for re-use from site.
   J. Remove excess excavated material from site.
3.03 FIELD QUALITY CONTROL
   A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.
   B. Provide for visual inspection of load-bearing excavated surfaces before placement of foundations.

3.04 PROTECTION
   A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
   B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION
SECTION 31 2323
FILL

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Filling, backfilling, and compacting for building volume below grade.

1.02 RELATED REQUIREMENTS
A. See Geotechnical report; bore hole locations and findings of subsurface materials in specifications.
B. Section 31 2316 - Excavation: Removal and handling of soil to be re-used.
C. Section 03 3000 - Cast-in-Place Concrete.

1.03 UNIT PRICING
A. Structural Fill: Applies to Unit Price UP-1.
   1. Measurement Method: By the cubic yard.
   2. Includes: Supplying fill, placing additional (or reduced) structural fill where required, and compacting.

1.04 REFERENCE STANDARDS
B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN·m/m³)); 2012.
D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012.
F. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

1.05 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Samples: 10 lb sample of each type of fill; submit in air-tight containers to testing laboratory.
C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
D. Compaction Density Test Reports.

PART 2 PRODUCTS

2.01 FILL MATERIALS
A. General Fill: Subsoil excavated on-site or imported borrow per Geo-Technical Report.
   1. Graded.
   2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and fat clays debris.
B. Structural Fill: Imported borrow.
   1. Graded as indicated on drawings or as specified in the attached Geotechnical Report.
C. Concrete for Fill: As specified in Section 03 3000; compressive strength of 2500 psi.
D. Drainage Fill: Natural stone, washed, free of clay, shale and organic matter, for free drainage layer under slabs on grade.
2.02 ACCESSORIES
A. Vapor Retarder: 10 mil thick, polyethylene.
B. Geo Textile Sedlator: Approved by Geo-Tech Engineer.

2.03 SOURCE QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of soil material.
B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
C. If tests indicate materials do not meet specified requirements, change material and retest.
D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION
3.01 EXAMINATION
A. Identify required lines, levels, contours, and datum locations.
B. See Section 31 2200 for additional requirements.
C. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.
D. Verify structural ability of unsupported walls to support imposed loads by the fill.

3.02 PREPARATION
A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.
B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING
A. Fill to contours and elevations indicated using unfrozen materials.
B. Fill up to subgrade elevations unless otherwise indicated.
C. Employ a placement method that does not disturb or damage other work.
D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
E. Maintain optimum moisture content of fill materials to attain required compaction density.
F. Drainage Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.
G. General Fill: Place and compact material in equal continuous layers not exceeding 12 inches compacted depth.
H. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
I. Correct areas that are over-excavated.
   1. Load-bearing foundation surfaces: Use structural fill, flush to required elevation, compacted to 100 percent of maximum dry density.
   2. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.
J. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving, slabs-on-grade, and similar construction: 98 percent of maximum dry density.
K. Reshape and re-compact fills subjected to vehicular traffic.
3.04 FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Use Structural Fill under footings and mat foundations: As indicated on the drawings.
   1. Fill to elevations shown on drawings.
   2. Maximum depth per lift: 8 inches, loose thickness.
   3. Compact to minimum 98 percent of maximum dry density.

C. Under Interior Slabs-On-Grade:
   1. Use granular fill and structural fill as indicated on the drawings.
   2. Compact to 98 percent of maximum dry density.

D. Backfill for Exterior Face of Foundation Walls and Footings:
   1. Use granular fill.
   2. Fill up to finish grade elevation.
   3. Compact each lift to 95 percent of maximum dry density.
   4. Do not backfill against unsupported foundation walls.
   5. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.

E. Over Buried Utility Piping, Conduits, and Duct Bank in trenches:
   2. Cover with general fill.
   3. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

3.05 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

B. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.06 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D3017, or ASTM D6938.

C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Frequency of Tests: Minimum of 2 tests per lift of each type of material.

F. Proof roll compacted fill at surfaces that will be under slabs-on-grade.

END OF SECTION